

The Technology Review

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Contents

FRONTISPIECE : Proposed Middle Span for the New Cambridge Bridge.

THE CAMBRIDGE BRIDGE

THE PLACE OF INDUSTRIAL AND TECHNICAL TRAINING
IN POPULAR EDUCATION . . . HENRY S. PRITCHETT

AN ECLIPSE EXPEDITION TO THE ISLAND OF SUMATRA
ALFRED E. BURTON

THE TASK OF OUR ALUMNI IN THE GOVERNMENT
SERVICE . . . FRANÇOIS E. MATTHES, '95

EDITORIALS

THE INSTITUTE :

Corporation Notes.— Faculty Notes.— Change in Entrance Requirements.— Publications.— Fellows and Graduate Scholars.— Society of Arts.— General Notes.

THE UNDERGRADUATES :

Addresses to Students.— Technology Field Day.— Field Day Dinner.— Fall Handicap Track Games.— Winter Meet.— Cross Country Team Race.— Tech Flag.— The Institute Committee.— Class Elections.— Clubs and Societies.— Cadet Dance.— Excursion of Naval Architects.

THE GRADUATES :

M. I. T. Alumni Association.— North-western Association of the M. I. T.— Washington Society of the M. I. T.— The Technology Club of Cincinnati.— Walker Memorial.— The Technology Club.— Announcement.— News from the Classes.

BOOK REVIEW

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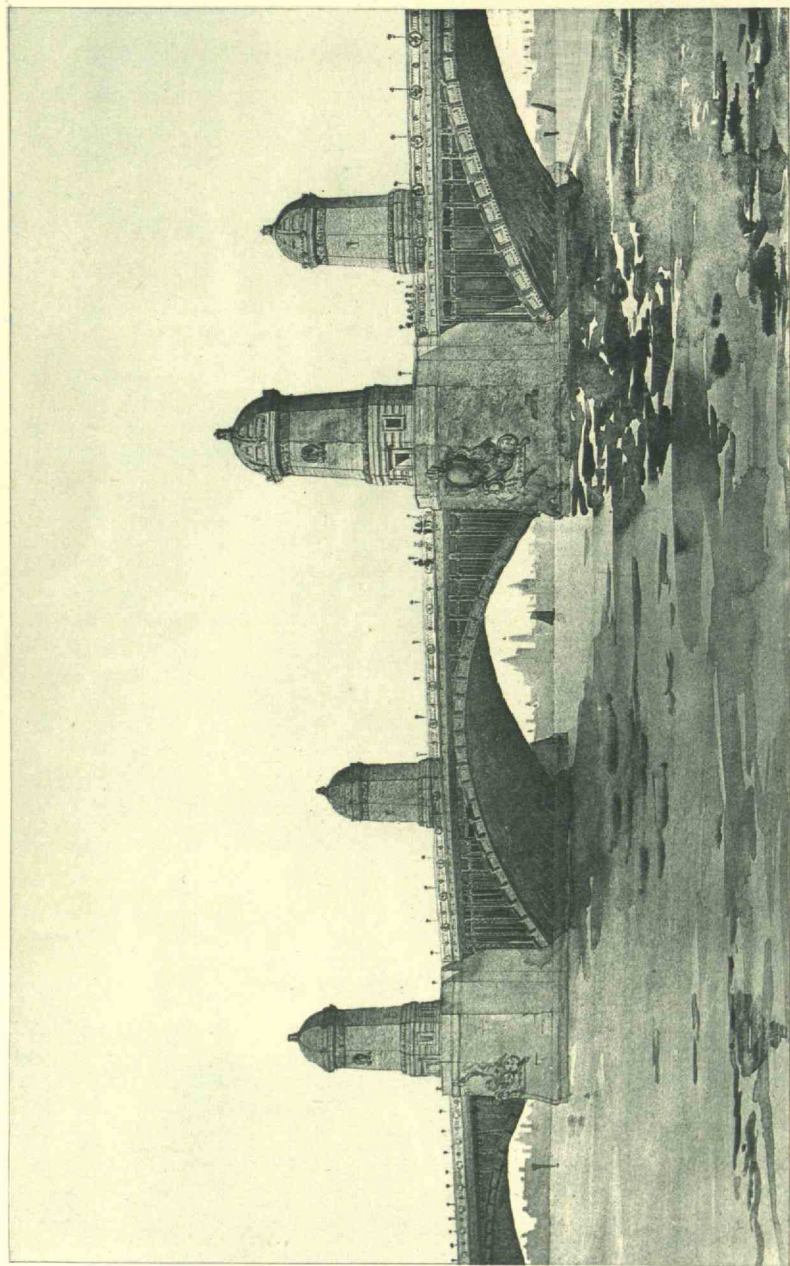
LEONARD METCALF, '92.

ARTHUR AMOS NOYES, '86.

JAMES PHINNEY MUNROE, '82.

WALTER BRADLEE SNOW, '82.

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THE CAMBRIDGE BRIDGE

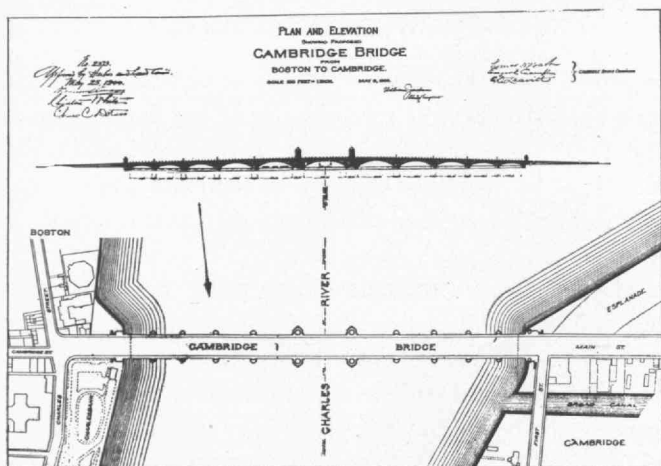
Few people realize that there is now being built across the Charles River a bridge which will be not only one of the finest structures of its kind in this country, but will be a rival of any in the Old World. It is of particular interest to the readers of the REVIEW, not only as marking another step in advance in the proper recognition by municipal authorities of æsthetic considerations in the design of public works, as well as in a hearty co-operation of the engineer and the architect, but also because of the large number of Technology men connected with the work.

The new bridge replaces the old West Boston Bridge, a wooden structure first built in 1792-93, which for some time has been inadequate for highway travel. This old bridge was made famous by Longfellow's poem, "The Bridge," written in 1845, the opening lines of which, "I stood on the bridge at midnight," are so widely known.

The question of a new bridge at this point has been agitated for a number of years. It first received legislative consideration by the Legislature of 1897, in connection with the general act to promote rapid transit in Boston and vicinity. The matter took definite shape in 1898, when the Legislature authorized the construction of the bridge by a commission consisting of the mayors of Boston and Cambridge, *ex officio*, and a third permanent member, who is expected to serve throughout the life of the commission. MR. E. D. Leavitt, of Cambridge, a well-known mechanical engineer, was chosen as third commissioner.

The Technology Review

It was recognized that a bridge on this site should be more than a structure built merely for utility, along the lines of strict economy. The Charles River is unique among American rivers owing to the fact that its banks for more than twenty miles are public reservations. The river broadens at the lower end of this park system into a beautiful basin, which will be crossed by the new Cambridge bridge, and the day is probably not far distant when the Charles will become one of the best water parks of the world. It

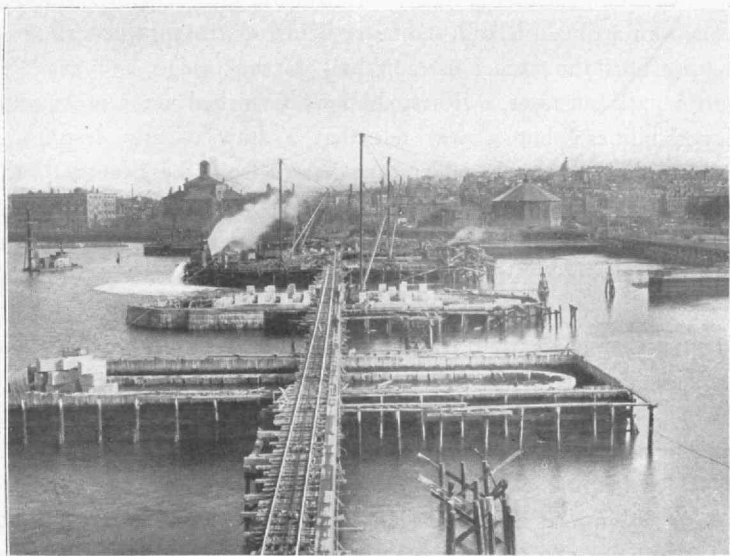


General Plan

is for this reason that it was determined at the outset that the bridge should be of a dignified and monumental character.

The commission organized in the spring of 1898, and appointed William Jackson (M. I. T. '68) chief engineer, and John E. Cheney (L. S. S. Harv. '67) first assistant engineer. Mr. Jackson and Mr. Cheney are respectively city engineer and assistant city engineer of Boston, and the latter is well known as a bridge engineer. Associated with them is Edmund M. Wheelwright, a leading Boston architect, and a Technology man of the class of '75. Before completing his course, however, Mr. Wheelwright left the Institute for Harvard College, from which he graduated with the

class of '76. Later he returned to the Institute, and took up special work in architecture. In the fall of 1898 Mr. Jackson made a trip to Europe to study noted bridges there. In Dresden he joined Mr. Wheelwright, and together they travelled in Germany, Austria, Russia, France, and England. A set of magnifi-



View of Piers, looking towards Boston, November, 1901

cent photographs of European bridges was secured by Mr. Jackson, and used for reference in the preliminary studies for the Cambridge bridge.

It is not so simple a matter to build a bridge over tide water as might be imagined. Although the bridge was authorized by the State Legislature, the details of the work were to a certain extent subject to the approval of the State Harbor and Land Commission and of the two cities interested; but, even with the approval of the state and municipal authorities gained, nothing could be done without the consent of the United States War Department, for the

Charles is a navigable waterway, and as such is under the control of the national government, through the Secretary of War.

The old West Boston Bridge had a draw which would allow the passage of any vessel of such size as could ascend the river. The earlier studies for the new bridge were made with the idea of using a draw; and several of the preliminary designs were for a bridge of stone or steel arches with a central draw channel running through an artificial island, the latter being of structural use to resist the thrust of the arches of each half of the bridge, and available also for park purposes. These designs furnished many architectural possibilities; but it was felt that a draw of any description would not add to, but would rather detract from the beauty of the bridge. Then the question of a drawless bridge began to be discussed, not simply from considerations of appearance, but from the standpoint of public utility as well. All admitted that a drawless bridge furnished far better accommodation to highway travel; and, as far as river navigation was concerned, it was pointed out that, as practically all the up-stream shore property was to be used for park purposes, the interests of the few remaining wharf-owners might be subordinated to the great number of people who would daily use the bridge.

After a long discussion and many hearings, the Massachusetts Legislature in 1899 authorized the commission, with the consent of the United States government, to build the bridge without a draw, provided it crossed the channel at a height sufficient to furnish a clear head-room of twenty-six feet above mean high water,—this height being sufficient to allow the passage of tugs and vessels without masts.

In the summer of 1899, however, matters were seemingly brought to a standstill by the action of the Secretary of War in disapproving both the proposed island in the river and the drawless bridge project. The objection to the island was that it would interfere with the tidal flow, and it was held that a drawless bridge would be an unreasonable obstruction to navigation.

This did not, however, end the agitation for a drawless bridge. The Massachusetts delegation in Congress was appealed to; and

Edgar R. Champlin, then mayor of Cambridge, and one of the commissioners, was delegated by the commission to go to Washington to advocate the drawless bridge project. As a result of Mr. Champlin's untiring efforts and as a precautionary measure, bills were introduced in February, 1900, in *both* branches of Congress, authorizing the Cambridge Bridge Commission "to construct a drawless bridge across the Charles River in the State of Massachusetts between the cities of Boston and Cambridge." The Senate bill, presented by Senator Hoar, passed both Houses of Congress, and received President McKinley's approval the following month.

Thus, after securing legislation by three successive State Legislatures, with concurrent action by the city governments of Boston and Cambridge, after complying with all requirements of State authorities, after numerous and lengthy hearings, and after a protracted controversy with the War Department, the adverse decision of which was finally overruled by Congress, the Cambridge Bridge Commission, at the end of the second year of its existence, was able to proceed with the final plans for the bridge.

During all this time the engineering and architectural staffs had not been idle. Some thirty or forty preliminary designs had been made and carefully considered, and from these came the final design shown in the accompanying illustrations.

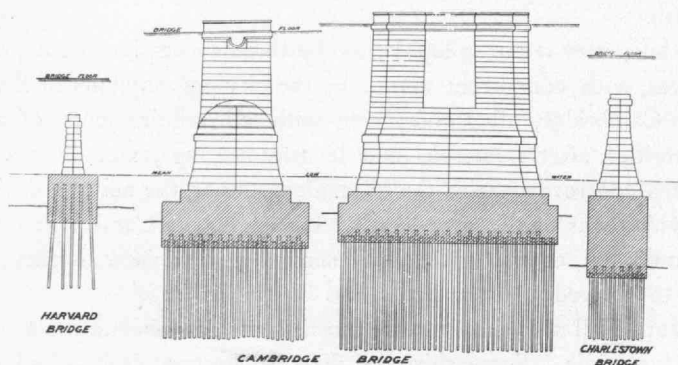
The length of bridge between abutments will be $1,767\frac{1}{2}$ feet, comprising 11 spans of steel arches of 12 ribs each, with spans varying from $101\frac{1}{2}$ to $188\frac{1}{2}$ feet. The height of the bridge at the centre is to be $48\frac{1}{2}$ feet above low water, which gives, in the centre span, the 26 feet of head-room at high water required by the Acts of Congress and the State Legislature.

One of the most striking features of the design for the bridge is the great size of the two central piers, beside which the largest piers of the Charlestown and Harvard Bridges appear insignificant. The foundations of these two central piers are each 201 feet long by 67 feet wide; the total height from the bottom of the piles to the surface of the roadway, 100 feet. These centre piers will have at each end ornamental stone towers 40 feet high above the road-

way, and smaller stone towers will be placed at the ends of each bridge abutment.

The bridge will be 105 feet wide between railings, making provision for four lines of car tracks, flanked on either side by a broad roadway and sidewalk. The two central tracks will be fenced in for the Boston Elevated Railway trains, which, like the surface cars, are to cross the bridge at the level of the roadway.

An idea of the magnitude of the undertaking can best be given by stating that the work will require 80,000 cubic yards of dredg-



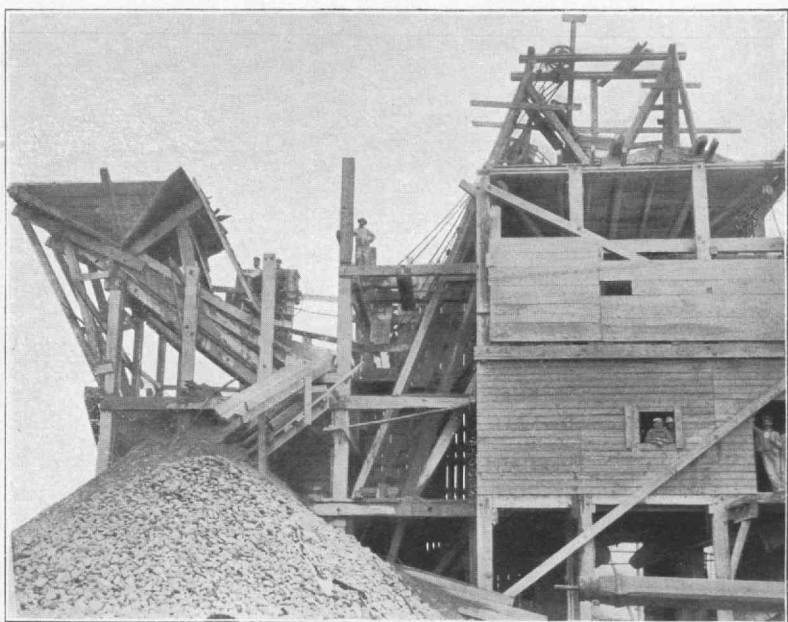
End Elevations of Piers

ing, 85,000 cubic yards of Portland cement concrete, 20,000 cubic yards of granite, 25,000 piles, 150,000 barrels of cement, and 8,000 tons of steel. These quantities are for the bridge only, and are exclusive of those required for its approaches.

The work of preparing foundations was begun in July, 1900, under contract with Holbrook, Cabot & Daly. James W. Rollins, Jr., a member of the firm, and a Technology graduate of the class of '78, has immediate charge of the work for the contractors.

The sequence of the work was as follows: A temporary wooden pile bridge of about the same capacity as the old West Boston Bridge was first built around the site of the new structure to accommodate travel during the construction of the Cambridge bridge. The old bridge was then demolished in the sections where

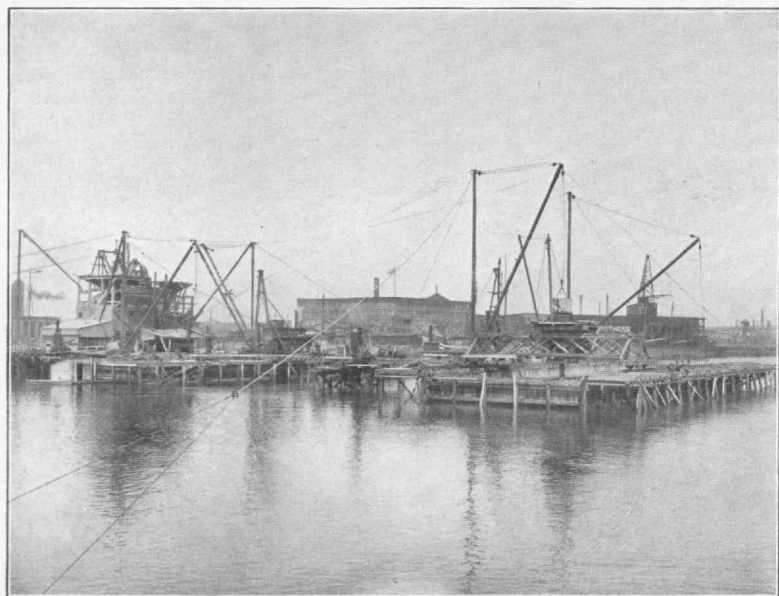
new piers were to be built. Next the mud, sand, and clay were dredged to a depth of from 18 to 24 feet below mean low water, carried five miles out to sea and dumped. Piles were then driven for the foundation, by a very heavy steam hammer and follower, to a depth of from 30 to 75 feet below low water, into gravel and hard pan. The piles, which were brought from Nova Scotia and



Concrete Mixer

New Brunswick, are of spruce from 20 to 50 feet long. They were driven in two sets, one being 2 feet higher than the other. After the first set was driven about 3 feet on centres, they were sawed off at the proper elevation by a circular saw mounted on a vertical shaft 60 feet long, which was driven from the deck of a scow by a belt, and so arranged that the saw could be set at any depth down to 40 feet under water. The second set of piles was then driven, and sawed off 2 feet above the first. A coffer dam of

6-inch tongued and grooved yellow pine timber was then driven around the pier, the timber being generally 40 feet in length. In this and upon the top of the piles was deposited the concrete made of Portland cement, sand, and gravel mixed in the proportion of 1 : 2 : 4, deposited through a tube under water up to an elevation of 6 feet below low water. The coffer dam was then heavily braced, caulked up, and pumped out by very large and powerful



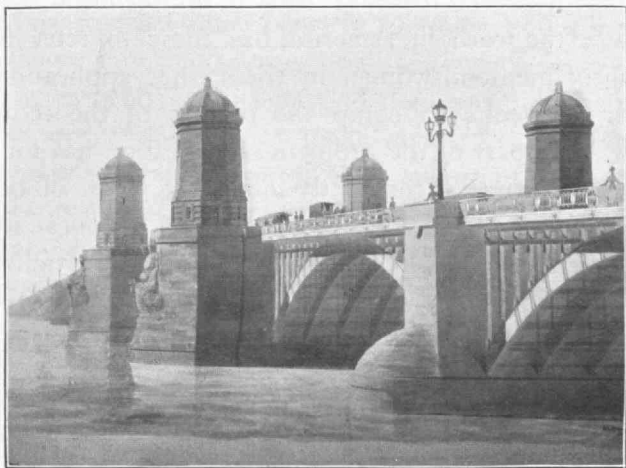
Depositing Concrete in Pier 7

centrifugal pumps, two of which could discharge from 20,000 to 25,000 gallons of water per minute, or over 1,000,000 gallons per hour. The rest of the work was then done in the open air with the dams free from water.

The top of the concrete foundation is at an elevation 5 feet below low water, and from that elevation the pier has a facing of heavy granite backed with concrete. The ten piers are already about two-thirds completed, and work will soon begin upon the abutments.

Upon these piers and abutments will be carried the steel arches and superstructure, covered by a heavy paved floor. Final plans for the superstructure are now being prepared substantially along the lines indicated by the frontispiece and following illustrations.

The bridge will probably be opened to travel two years hence. Its cost is estimated at about \$2,500,000.00, to be borne equally by the City of Boston and the City of Cambridge. The bridge act provides, however, that the Boston Elevated Railway Company "shall pay toward the construction of said bridge such portion thereof as shall be rendered necessary by reason of its being of additional size and strength for the use of the elevated railroad." The amount to be paid by the railway company is to be determined by a commission appointed for the purpose.



THE PLACE OF INDUSTRIAL AND TECHNICAL TRAINING IN POPULAR EDUCATION

In attempting to speak to you upon the matter of Industrial and Technical Training in Popular Education, I am taking up a subject which is receiving at the present time the thoughtful attention of serious and far-sighted men. In order that the consideration of the question which is possible during the present hour may lead somewhat, I shall confine my consideration of the subject to a discussion rather of industrial training and its part in popular education than of the higher forms of technical training. And this for several reasons: First of all, technical training, as we use the word in America, has come to refer to the training of men and women in the higher applications of science. It seeks to equip the officers of the industrial army. This part of the problem of education has for forty years past received a constantly increasing share of our attention, with the result that the number of technical schools and universities in which the higher technical training is given has grown enormously. And whatever may be the merits or faults of our present education, and however far it may be assumed that its present stage is one of transition, it must at least be admitted that the needs of the higher technical training are receiving more attention than almost any other part of our educational processes. In every State in the Union there exist schools for this training for the higher industrial life,—the life of the engineer, of the chemist, of the manager, of the man who in one way or another is to act as a leader in the industrial army. But, after

all, the number of leaders who are needed is limited; and it is worth while asking what is being done in America and what can be done for training the sergeants and corporals and privates of the industrial army, the superintendents and foremen and skilled workmen who man our mines and mills, who build our roads and bridges, who make and transport our manufactured products.

There are in this country at present, approximately, 80,000,000 persons. Of this number, approximately 20 per cent., 16,000,000 in all, are between the ages of fifteen and twenty-four,—are eligible, in other words, to the opportunities of the high school and the college. Of this vast number of eligibles, less than one-third of one per cent. are receiving any formal instruction from the State or from private institutions concerning the sciences and arts which bear directly upon their occupations. It is at least worth asking whether our plan of popular education can be made to minister to this vast host which does not now share in its advantages beyond the elementary school.

In order that I may make myself clear, let me ask a moment's consideration of the wording of my subject and the conception of education which it implies. I am to speak to you concerning the place of industrial training in popular education. This language is assumed to apply to the United States, and that the people who are to be educated are those of this country. It assumes, further, that there is to be a popular education, or an education of the people.

Assuming all this, our inquiry concerns itself with the part in this education of the people which industrial and technical training should have; and I have limited the inquiry by confining the discussion to elementary technical training alone.

The subject assumes, furthermore, that there is a distinction between education and training, and that the latter is a factor in the former. The derivation of the word "education" carries a meaning not always remembered. To be educated is to be drawn out. Education embraces all the processes by which a human soul comes to have contact in larger and larger measure with all other souls. It is the resultant of all the forces by virtue of whose influence a human being finds his place in the world. The education is successful when the individual finds for himself the best place which he is capable of filling.

Human souls have various moduli of elasticity. Some are capable of being drawn out in many directions, and attach themselves by the threads of sympathy and interest to every object that offers. Sometimes these tentacles are very foolish ventures, like the thread which a spider spins from his web to the nearest object and directly across the path of the passers-by, only to be swept away. And, then, there are souls of such curious elasticity that they can be stretched out or educated only in one direction, so that ultimately they become hard, tense cords in the general structure of society, and can only be touched by some vibration which is adapted to their particular stress. However it is done or whether it be in large or in small measure, education is that drawing out process of the human soul by which a man finds his place in the world.

But the difficulty which has beset all serious inquirers is the question what to teach in order to educate. Plato and Aristotle, Milton and Rousseau, Spencer and Bain, all agree as to what education is; but the burning question is "how to educate," how to draw out the soul of a man so that it may find its most efficient contact with the world in which he is to live.

Men have agreed by one process or another that one of the most effective ways of stimulating the powers of youth is to bring them together in a school, and to teach them certain things which are believed to assist in the development of the latent powers of the individual. Now it is so much easier to point out the faults of a system of teaching than to indicate the means for correcting those faults that there has never been agreement among schoolmasters as to the subjects which might be taught in the schools in order to develop the qualities of a student. Men ask to-day as anxiously as did Aristotle in his day: "What, then, is education, and how are we to educate? For men are not agreed as to what the young should learn either with a view to perfect training or to the best life."

Furthermore, into most human lives there is thrust the problem of earning a living. So fierce is human struggle at this age that the earning of a livelihood, if the living is to be a comfortable one, requires the possession on the part of the individual of expertness in some one direction. This education in one or more directions to the point of expertness we call training, and training is admitted to be a part of the proper work of the school.

Now, while in America the schoolmasters have no more been able to agree than their brethren in other parts of the world, at least two general theories may be traced in the formation of our schools and colleges. One is the theory that the growing human being should have an opportunity to develop in many ways, that the elastic soul should be encouraged to throw out as many tentacles as possible, and that the system of studies which presents the greatest number of points of attachment is the best one. This process is usually called that of acquiring a broad and liberal education. A second principle, and one that finds almost equal

recognition in the institutions of learning of the present day, is the idea that the student must train to the point of expertness in some one direction.

In order to meet these somewhat divergent requirements, we have provided in our higher institutions of learning courses of study intended to minister on the one side to general culture and on the other to special training; and we undertake to furnish instruction which shall give the student a broader outlook and a wider sympathy, while at the same time he is guided into the straight and narrow path of professional expertness.

The working out of these two theories during the past generation has resulted in the development of two kinds of institution, one of which affords the student a greater or smaller opportunity for education with little or no training, and another which gives him a more or less effective training with little or no education.

Unfortunately, notwithstanding two thousand years of discussion, no criterion has been invented by the application of which it may be determined if a man be entitled to be called an educated man. It is rather by the absence of certain qualifications than by their possession that this test can be applied. Perhaps it would be generally admitted that no man may be fairly termed an educated man until he can read and write his mother tongue with ease and facility, nor until he has some acquaintance with, and has developed some taste for, the best literature of his own country. Judged by even so modest a standard, it seems probable that a large proportion of the graduates of our colleges and scientific schools of to-day are not educated men. One finds amongst these graduates a large number to whom the colleges have brought education without training, and a large number to whom they brought train-

ing without education. The two do not always go together. Charles Sumner was a better trained man than Abraham Lincoln. He was not so well educated.

This problem is a vital one before American colleges to-day,—how to combine education with training, how to make a human soul alive to literature, to art, to science, to nature, to religion, to human kinship, and yet at the same time to point out clearly that narrow path which leads to efficiency and economic success. And yet this ought to be possible. A narrow road may have, after all, the widest horizon, if only it leads over the heights.

All this is in one sense apart from the subject under consideration; but it has this relevancy,—that, so far as our discussion of education in this country has crystallized into practice during the past generation, it recognizes that education of the people should minister, in the higher institutions of learning, both to the expanding of the student's horizon and to his special training as well; that in the age in which we live the university should train as well as educate. If this principle is true for those who enter college, it is true in a still larger sense, then, for those who, while carrying on the struggle for existence, are at the same time striving for a wider outlook and a higher efficiency.

The practical question which actually confronts us is this. There are sixteen million persons in the United States between the ages of fifteen and twenty-four. About four millions of these are in high schools and colleges. For twelve millions the opportunity of the regular day-school has gone by. Can a rational and feasible plan be devised by which this large majority of the youth of our country may have opportunity to better themselves by further education, and to increase their efficiency by effective training given in schools such as they can find time to attend?

Let me answer this question, not by indicating an ideal solution, but by briefly describing the way in which the question has been answered in another city, in another land. Fifteen years ago the city of Berlin undertook the solution of this same question. The consideration of the problem was placed in the hands of earnest and thoughtful men. The result of their labors has led to the establishment of a system of secondary technical schools, whose character and function I shall endeavor briefly to describe.

In examining the plans for industrial education in Berlin, one needs to remember that the system of regular day-schools in all German cities includes not only the *Gymnasium* which leads to the university, and the *Realschule* which leads to the higher technical school,—corresponding approximately to our high schools and manual training schools,—but it includes as well a system of secondary schools intended for those who are to follow a particular trade or craft. Each of these secondary technical schools is usually adapted to the branch of technical education needed in the particular district in which it is situated. Where yarns are spun, a spinning school; in the midst of iron works, a school of elementary metallurgy. The instruction, while elementary, is thorough on both the practical and theoretical side; and all the questions involving the success and progress of the special industry are investigated and explained. These schools are neither high-grade engineering schools, like the Institute of Technology, nor are they simple trade schools, like the New York Trade School. Germany has her great technical schools for the higher engineering, and she has trade schools as well, although these latter seldom confine themselves to simple instruction in the trades they represent; but she aims also in these secondary technical schools to meet the

wants of those who are to go into commerce or into a trade, to present the opportunity for education, while giving at the same time such minute training as may minister most directly to the calling in life which the pupil is to follow. All these are schools conducted in the ordinary school-houses and in the usual school hours.

But the city of Berlin does not stop here. With characteristic German thoroughness, a system of commercial and industrial education has been planned for those who, while earning a livelihood, are ambitious for further improvement. The system in use is so fully and rationally developed that it deserves a more extended description than I can give here.

These schools are free except in a few cases where small fees are charged, and are held in the evenings and on Sundays from 9 to 12. They may be divided into two classes: (1) continuation schools (*Fortbildungsschulen*), (2) monotechnic, or trade, schools (*Fachschulen*). It would not be fair to call the first class non-trade schools, as they all have a directly practical aim in reference to the student's occupation, either in commercial life or in the trades. The most obvious distinction between these and the second class, or trade schools, is seen in the teaching of German, English, and French in the former, and their omission in the latter. Technical detail is also carried out very much further in the latter. Drawing is almost universally taught, except in a small number of commercial schools. The importance assigned to this subject is characteristic of the German system at large.

It is a general condition for entering both classes of schools that the pupil shall have completed the common school course (the *Volksschule*), which is supposed to be finished at fourteen, the last year of obligatory attendance.

In certain of the special trade schools, as will be mentioned later, it is required that they shall be actual workmen, apprentices, members of a trade, or in training for the counting house.

The first class of schools mentioned (the *Fortbildungsschulen*, or city continuation schools) are conducted in four groups. One group is devoted to the evening commercial schools. These are intended for persons in practical occupations who are desirous of re-enforcing their acquirements. The subjects taught are German, French, English, mercantile arithmetic, book-keeping, drawing, mathematics, physics, stenography, and typewriting. Four such schools are maintained, each forming an annex to some high-grade institution (either a *Realschule* or a *Gymnasium*) by whose director it is governed. The second group of continuation schools maintained by the city of Berlin is intended to offer to those in a practical calling such advanced studies as may "aid in their calling and strengthen their morals." These schools aim also to make good deficiencies in elementary training. There are twelve such schools for boys supported by the city, and one by the Artisans' Union, attended by some 10,000 pupils. They are all adjuncts of the common schools, using certain rooms in the school buildings, governed by the same principals, and paying their proportionate cost of the school material which is used. Thirteen schools of corresponding character are maintained for girls, attended by nearly 6,000 pupils. Nine of these are supported by the city and four by private effort. The purpose of the girls' school is stated somewhat differently: "to improve their general education, to supply mental stimulus, for fixing serious views of life; to cherish the inclination and the skill for suitable woman's work." Exclusive attention to technical

subjects must be avoided. Both girls and boys are taught German, French, English, arithmetic, drawing (very fully), book-keeping, stenography and typewriting, and to some extent history, geography, and commerce. The boys have certain additional advantages in mathematics, elementary chemistry and physics, and law, together with special advantages in the drawing courses for the trades of lithographer, engraver, decorator, upholsterer, etc. The girls learn needlework, embroidery, machine-work, millinery, and commercial correspondence. Singing and gymnastics are taught in nearly all the schools.

A third group of continuation schools, attended by some 2,500 pupils, is that of mercantile schools. The fourth class of continuation schools is devoted to the teaching of the blind and deaf.

In all there are in the thirty-seven schools of this class over 18,000 pupils, of whom 3,000 are in mercantile schools, the rest in schools looking mainly to the individual development of young artisans in directions favorable to their professional improvement.

The second division of evening schools ministers directly to the special trades, being, in fact, monotechnic schools. The universal aim in these schools is to make up for the loss of formative power (*Bildendekraft*) in shops, due to changed customs and wages, and especially to progressive subdivision of labor. The schools are so varied in character that only the briefest mention can be made of them. Amongst those supported by the city are the city textile school (which is used for one set of pupils during the day and another at night), intended for merchants, journeymen, apprentices, and embroiderers; two artisan schools, supported by the city with some help from the

State, with courses in cabinet-making, painting, modelling, and art-work in metal; the school of architecture, having for its purpose the training of workmen and master-builders; the city tradeshall, a school for those engaged in the trades of locksmith, instrument maker, machine builder, electro-mechanician, and allied branches; the school of joinery, intended to give thorough training to joiners and turners in drawing, modelling, wood-carving, joining, chemical treatment of wood, etc.; and, finally, some twenty-one special trade schools, whose support comes from various sources, but chiefly from the city. The State adds a small quota, and two are supported by the guilds themselves.

The object of these schools is to supply instruction in the trades which cannot be given in the shops. The persons for whom they are intended are primarily apprentices and journeymen. In many trades the apprentices are required to attend. The schools minister to a wide diversity of trades' workers, such as masons, carpenters, shoemakers, painters, barbers, saddlers and harness-makers, decorators, smiths of all kinds, glaziers, wheelwrights, bookbinders, basket-makers, gardeners, printers, tailors, confectioners, photographers, braziers, and coopers. The variety of interests and occupations represented in these schools is most striking, and the dissimilarity in their constitution and government indicates that much has been left to individual initiative. The attendance in these schools is something over 10,000.

A noticeable feature of the whole system is the friendly relation existing between the workmen's guilds and the city schools. The officers of the guilds take a helpful part in the government of the schools, and it is in large measure due to their influence that so many apprentices attend

them. In all some 27,000 pupils attend these evening schools in Berlin, either for the purpose of general culture or for helpful training in their own callings; and of this total about 17,000 are apprentices.

So complete is the provision here made for the encouragement of the ambitious youth that any apprentice or any workman may find in these schools the opportunity he seeks, whether it lie in the direction of wider education or in the desire to improve himself in the technique of his trade.

Let us examine for a moment the opportunities open to a youth of Boston similarly circumstanced. Suppose a boy or a girl, a man or a woman, to have completed the grammar school course, and to have begun the earning of a living in some commercial or industrial calling in Boston, as clerk, apprentice, or journeyman: what opportunities are open to such an one for further education and for further training?

The two agencies which the city provides for the education of young wage-earners are represented by the evening high school and the free evening drawing schools, the two taken together constituting a very near approximation to the first group of Berlin continuation schools. In the evening high school a student is offered instruction in arithmetic, algebra (a two years' course), geometry, English (a three years' course), French, German, Latin, chemistry, and physics, book-keeping, stenography and type-writing; and, in the drawing schools, free-hand and mechanical drawing, clay modelling, and the principles of design, composition, and color. Between three and four thousand pupils attend the classes of these evening schools. They serve the same class of pupils as that attending the first and second groups of Berlin continuation schools just

described, and in the main they represent a general similarity of subjects taught. The chief difference between the two lies partly in the conception of what ought to be taught and partly in the manner of teaching.

In the Berlin school the German language and literature are relied upon as the surest and most fruitful source of culture. It is helped out by elementary mathematics and physics, taught, however, rather as an aid to the solution of practical problems in every-day life. In our Boston school the student is offered more mathematics, more chemistry and physics, and Latin in addition. Both schools aim to strengthen the intellectual grasp, while at the same time aiming to help toward good morals. The one undertakes to do this by devoting the larger number of hours to subjects which have a direct bearing in practical life, the other by devoting the larger number of hours to subjects which are in the nature of culture studies.

When one seeks, however, in the public evening schools of Boston any which correspond to those of the second division of Berlin evening schools, he seeks in vain: they do not exist. There are no city schools in Boston corresponding to the monotchnic schools of Berlin. Our system of public instruction does not undertake to furnish to the apprentice or to the clerk or to the journeyman, by formal instruction, the opportunity for improvement in his own craft. The ambitious youth in Boston who seeks such improvement finds open to him the following opportunities for such training:—

If he be an apprentice, he may avail himself of such opportunities as the apprentice system offers for improvement in his trade. But it is becoming more and more difficult for the apprentice to obtain from this relationship the training which came from it a generation ago. Not only is

the association between master and apprentice no longer what it once was, but the changed functions of modern machinery make smaller the opportunities for getting what the Germans call formative power.

Outside of his employer's office the young workman may turn to one of the following avenues of improvement: In the schools of the Young Men's Christian Association and the Young Men's Christian Union he may obtain certain training bearing upon the work of a trade or a craft. The instruction given by both of these institutions in drawing, modelling, and kindred subjects, is most creditable to those who have charge of these noble organizations. The facilities which their evening schools afford have helped many a man struggling to get a better foothold in his trade or in his craft.

The opportunities which Boston offers to acquire scientific knowledge of a particular trade are limited, and such facilities as exist are maintained by private means. Instruction in practical plumbing and printing may be had by a limited number at the North End Union on payment of a fee of \$10 a term. No one under seventeen is admitted, and only those who are already in these trades are taken. Somewhat similar instruction is offered at the South End Union. At the trade school of the Massachusetts Charitable Mechanics' Association, instruction is given to a limited number in three trades,—bricklaying, carpentering, and plumbing. At the North Bennet Street Industrial School, instruction is given in leather-work, printing, clay modelling, basket-work, dressmaking and millinery, cooking and domestic science. Instruction in some of these branches is given at the Wells Memorial Institute. Lessons in cooking and in sanitary housekeeping are offered in the evening by the Women's Educational and Industrial

Union. These schools, maintained by the efforts of private citizens, represent the opportunities for formal instruction in the arts and crafts for working men and women.

Other efforts for such instruction have been made in cities very near Boston, such as the Textile School at Lowell, which is filling so fine a place in the training of men for industrial work ; but these, after all, belong rather to the State than to the city. When all is said, the opportunities open to the young artisan of Boston for self-improvement are meagre compared with those which lie within the reach of the artisan of Berlin.

Somehow, the German plan of using a technical equipment,—for instance, that of a manual training school,—to its full capacity, by instructing one class of pupils in the day and another in the evening, is not one which has as yet commended itself to our American teachers ; and it must be admitted that the teaching of the use of hand-tools in this country, while it undoubtedly offers a valuable addition to the school curriculum, makes this contribution on the academic side. Instruction in manual training forms in this country practically a culture study : it contributes almost nothing to the betterment of those in trades. Granting much that has been claimed for manual training, it seems nevertheless true that, in this country at least, it has done almost nothing to bridge over the difficulties which lie between the untrained apprentice and the skilled artisan. This has been due in some measure, it seems to me, to the great fear which its advocates have had lest it minister to utilitarian ends, and to their intense desire to have it, first of all, rank in dignity with older studies. Their attitude reminds one, in some measure, of the toast offered by a Senior Wrangler, when he said, “ Here’s to

pure mathematics, and may it never be of any use to anybody !”

But the ambitious young man or woman in Boston who is earning a living, and who is willing to struggle for the increased power and pleasure which come from technical knowledge of one's own calling, has not exhausted his opportunities in the night schools maintained by the city and by private thoughtfulness. There has grown up during the last ten years another agency which is within reach of the man who has to make a living, if he can afford it; and this is found in correspondence instruction, given by correspondence schools.

Few college men, I am inclined to believe, are aware of the amount of instruction now being given by these agencies, notwithstanding the fact that two of our universities have, in part at least, committed themselves to a plan for giving instruction in this manner. The number enrolled in correspondence schools at the present time exceeds considerably the total enrolment of all the colleges and technical schools of the United States. While many of those enrolled are studying commercial or English branches, the large majority are endeavoring to obtain in this way technical instruction of an elementary sort. These schools now offer to decorators, to draughtsmen, and to designers instruction in the arts which bear upon their work; to machinists, pattern-makers, foundrymen, blacksmiths, plumbers, sheet-metal workers, miners, carpenters, etc., instruction in their trades; to stationary engineers, locomotive engineers, trainmen, dynamo tenders, linemen, and motormen, instruction in the care and operation of machinery, as well as technical instruction to those who desire to become civil engineers, mechanical engineers, architects, and chemists.

It is no part of my purpose to discuss here the quality of the work accomplished by these correspondence schools or to deal with the question of correspondence instruction; but the enormous proportions to which this enrolment has grown is indicative of two very significant facts. The first is this: In all industries the demand is becoming urgent for men and women who have had sufficient training in applied science to grasp the plans of the engineer above them, and who have the practical knowledge to carry them into execution. The second fact to which I refer is the spectacle itself, of this large number of men and women in the correspondence schools, paying out money earned in many cases with difficulty, and saved only after self-denial, in order to acquire the scientific knowledge necessary to understand the tools with which they are working, and to make the most of these tools. The growth of correspondence schools, whose students are drawn almost wholly from those who are denied a college training, is the most striking evidence which could be presented, not only of the need which such men feel for additional training, but of their determination to obtain it.

It is not necessary to give the complete enrolment of the army of students in the correspondence schools to indicate something of the desire for instruction. In Massachusetts itself more men and women are seeking technical training in correspondence schools than in all other technical schools, public and private, combined. There is to me a touch of pathos in the thought that the efforts of American men and women for a better training have become the foundation of a profitable business.

This completes the enumeration of the avenues open to the wage-earner of Boston who, leaving school at the end of the grammar school period, seeks later on to better him-

self by a wider education and a more effective training. For the one, he may go to the city evening schools; for the other, he may try apprenticeship, the schools maintained by private enterprise, or the correspondence school maintained by its own enterprise.

When we compare with these the opportunities offered to the youth who begins his industrial or commercial career in Berlin, the contrast is most striking; and the significant feature of the contrast is the fact that the one city presents a system of public education founded upon no effort to study the conditions which are to be met and to meet them, while in the other there is presented a plan which is at least consistent, which rests upon an intelligent study of the whole question of the education of the people, and which aims to meet in a rational way the varying wants of all classes.

I have thought it worth while to spend so much of this hour in a comparison of educational opportunities in two specially chosen cities, not for the purpose of suggesting that we in Boston should blindly follow what has been done in Berlin, but rather for other reasons which I will endeavor to state briefly.

First of all, I desired that the discussion of this hour should not be wasted, and that it should lead somewhere. It has, for this reason, seemed to me wiser to point to a definite effort to meet the conditions of modern life by education and training than to talk of abstractions. It is never a waste of time to call attention to the fact that all truth and all wisdom are not confined to one nation or to one sect or to one party. The nations of Europe have been trying social experiments longer than we. I believe we may safely learn something from their experience if we approach the problem in the right spirit.

The Berlin experiments of the last fifteen years are especially worth our study, because those who have there had the matter in hand have endeavored to struggle, not with a partial solution of the problem of education and training, but with the problem as a whole; and, in doing this, they have recognized fully the two ideas which have been most dominant in American educational processes for the past generation, namely: that the teaching of the schools must aim, not only to educate, but to train; and the converse, that it is not enough simply to train in the school, but that the school should educate as well. Not only have they recognized these two needs, but, keeping both in mind, they have not hesitated to grapple with the fact that different groups of students enter the preparatory schools with widely varying purposes in view, and that these purposes must be kept in mind in the education of these boys and girls. They have taken the view that, if the truths and processes of modern science and of art were helpful to the leaders in the industrial world, they could be no less helpful, if taught in the right way, to those in the ranks. Admitting all these facts, they have gone on to offer to the youth of their city a system of schools planned in a consistent and intelligent way to meet, not the wants of a single class or of a single trade, not a hard-and-fast system, but a system at once comprehensive, elastic, and representative of the whole people. And whether the solution which Berlin has reached be a wise one or not, whether it accomplishes the entire end for which it is aimed or not, it is at least worthy of our study as being an intelligent, a comprehensive, and a systematic effort to do that which in Boston we are doing in a desultory and a partial way.

The study of the Berlin system of industrial technical

schools conducted for wage-earners has for us another point of still greater significance, which is found in the attitude of organized labor toward these schools. The Berlin industrial schools are being conducted with the co-operation and with the help of the artisans themselves, and of the trades-unions into which they are organized. There has been an impression that in this country the trades-unions are hostile to industrial schools. I do not know how much truth there is in such an assertion. Organized labor in America has sometimes been unfortunate in its leaders, and has been thereby betrayed into some foolish and short-sighted actions. For myself, I have faith in the sincerity and in the ultimate fairness of the real American workman, whether born on this side of the Atlantic or the other. I believe that he will not be slow to see that industrial schools are to mean to him the quickest road to power and to independence which organized society has yet offered to him. But, whether this be true or not, it is certainly true that the first step to success in such an undertaking is the co-operation and interest of workingmen themselves, and of the organizations through which they express themselves. Men are never reformed from without or against their wills. By the same token they do not permit themselves to be educated from without or against their wills, and the first and wisest step in any system of industrial education is to enlist the interest and the confidence of those who are to be educated.

The reasons put forward by the advocates of a system of industrial schools for this country are usually based upon utilitarian considerations. They point to the example of Germany, and urge that her industrial success has been due in large measure to her system of education, and that success rests not only upon the officers of her indus-

trial army drawn from the high-grade technical schools, but upon the rank and file trained in the industrial schools as well. Without similar training, they say, we are likely to fall behind in the race for industrial supremacy. I believe there is much truth in these claims, and that they alone form a sufficient reason for a careful consideration of elementary technical training as a part of our system of popular education. There are other reasons, however, that to my mind appeal more strongly than any consideration of dollars and cents, even when that glittering prize "industrial world-supremacy" is held out as the trophy of success.

One reason, and a primary one, for the establishment of schools for commercial and industrial training as a part of a system of popular education, is the fact that a system of popular education should in reality be what it calls itself, a system of education for the people and for the whole people. As our schools are at present maintained, the people, as a whole, share in them only up to a certain point; and, while it is true that the opportunity to continue in the high schools is open to every citizen, it is in fact closed by stress of circumstances over which pupils themselves have but little control. The average schooling for the entire nation is at present eight hundred and sixty days for each person. This would give four years and three-tenths, allowing two hundred days to each school year, enough to take a pupil through the primary schools of a city. Even Massachusetts, with all its schools, public and private, does not give enough schooling to amount to seven years apiece for its inhabitants. Some States of the Union give, on the average, only a little more than two years. It is worth noting in this direction that Massachusetts, with nearly twice the average schooling per indi-

vidual, produces twice the amount of wealth per individual as compared with the nation's average.

I have always been at some loss to account for the fact that 80 per cent. of all children are withdrawn from school upon the completion of the preparatory school course, even in well-to-do communities. It is due not wholly to poverty and to the need for the services of the boy or girl, but also to the feeling of the parents that the schooling to be acquired by a longer stay is of no practical benefit in the trade or in the commercial career which the pupil is to attempt. Many of the pupils withdrawn realize in a very short time the need of a better education and a higher training; and, to my thinking, it is most desirable that some door easily accessible be left open to that great majority of our youth outside the schools, by which they may find the education which may minister to breadth of view and the training which may help toward efficiency. Such an opportunity means not only a great increase in skill and in power for a large part of our population, but it means as well an enormous influence which shall work for a higher form of manhood and of womanhood.

Further, the introduction of industrial and commercial preparatory schools into our educational scheme will serve, not only as a partial corrective to certain tendencies which now tempt boys and girls away from the lines in which they might be most useful, but by putting forward the opportunities for a better form of commercial and industrial training will help to maintain the dignity of labor itself.

The following abstract from the report of a well-known officer of the Navy engaged in recruiting apprentices for the Navy is suggestive of certain tendencies in our education in New England which need to be taken into account in any study of a present and possible system of public instruction:—

"I enlisted boys from all parts of the country, and necessarily saw the conditions surrounding the poorer classes in many cities. After one trip to Boston, where I enlisted several hundred boys, I was satisfied that education, or rather over-education, was doing great harm in New England. Book schools were not doing what industrial schools would have accomplished. Each morning, when I went to my office at the Navy Yard Gate, I found a long line of fairly well-dressed boys with very shabbily dressed parents. In every case the boy had spent his life in school, winding up in many cases in the high school, and after that finding nothing to do. The parents were striving hard and stinting themselves that the boys might appear well, while the lads were growing up more and more ashamed of themselves and of their surroundings, and of their honest fathers and mothers. To save them from pool-rooms and worse, they begged me to take them as apprentices in the Navy, and let them begin anew their education."

Inasmuch as the large majority of all who enter the common schools have eventually to earn their bread by some form of labor, whether it be on the farm or in commerce or in the arts and crafts, it is worth while to have such recognition of this fact in at least some of the schools as will make a boy or girl proud to prepare himself or herself for such a life. We have grown too much accustomed in our schools and in our colleges to hold out the extraordinary rewards of college education or of technical training as a reason for education and for training. The "room at the top" motto has been overworked. To urge upon young men the advantages of college education and of college training, because this engineer or that chemist has achieved extraordinary financial or popular success, is in some ways similar to inviting them to invest in a lottery. Schools and colleges exist not for the preparation of the few great successes, but because we believe that the education for which

they stand is a preparation for a wiser, more useful and more contented life. It is equally desirable that the State should say to a still larger class of citizens that in the pursuits of commerce and industry they may find a life which satisfies the intellectual and artistic and moral aspirations of men, to commend to them the life of industrial and commercial effort for its own sake.

And, finally, such schools seem to me most desirable in a democratic government as a means of holding together by a common thread of interest the whole body of citizens. It will be a bad day for our institutions when those who work with their hands come to feel that they have any smaller interest in our common schools than has any other class of citizens. Men have seen, during the last generation, the conserving influence in society weakened at many points. Two generations ago master and apprentice met on a common plane at the meeting-house. To-day it is a far cry from the man who sits in a pew to the man who tends the dynamo supplying the light by which the minister reads his sermon. In the problems that face us in the future it is most necessary that distinctions of class be not further accentuated. There is no surer way to promote this desired solidarity than by a system of education in which those who direct the education are kept in touch with the great body of citizens. There is no common thread of interest running through the whole fabric of our political life better calculated to exert a unifying touch upon all classes of citizens than that which has to do with public education. For this reason, if for no other, it is vital that education in a republic minister to the whole people, and that it consider in its ministry the needs of those whom it is to serve.

And now, one naturally asks, what is the practical change

which should be made in order to make our public school system minister to the wants of all the people? What schools can be added to those already maintained which shall serve the double purpose of education and training? How should they be organized, by whom controlled, and how maintained, in order to serve in the widest sense the whole people?

Such an inquiry is a perfectly fair one. It is the one toward which our whole discussion has led us. Unless it can be answered in a practical way, such discussions have no purpose. I shall endeavor to reply to it as directly as it seems possible to do.

First of all, it seems to me that, if one suddenly found in his hands the arbitrary power to make changes in our system of popular instruction, he would neither add to it new features nor take from it old ones, for the present; that, looking back over the evolution of our present schemes of education (we can scarcely call them systems), he would recognize that these educational processes are still in a transition stage. Forty years ago, and following the Civil War, a mighty desire for education came upon us. For a time we believed that all education was good, and the more of it, the better. Every institution in the land strained to the utmost to teach every subject,—a theory which found its perfect fruit in the idea that every institution must teach every subject to every student. All the doctors in education have been allopaths.

After a while we discovered that this was all wrong, and a new set of doctors came in who believed in educational specifics. The number of special studies and methods of training which have been put forward in the last twenty years, warranted to be infallible educators for man and beast, would almost equal the number of patent medicines.

The experience of our schools is painfully like that of a gentle Oriental nation which undertook to found a university. Those who had in their hands the appointment of professors had a theory that any American or any Englishman could teach any subject. Accordingly, a faculty was selected at the nearest seaport from amongst the butchers and sailors. The results were interesting, but hardly satisfactory. There were periods when the entire faculty was disabled for days as the result of prolonged investigation of the physical qualities of *spiritus frumenti*. Gradually the officials in charge of the university arrived at the generalization that not all foreigners could teach. The sailors were accordingly sent about their business, and a faculty selected who were all missionaries. The result was an enormous improvement, but still not all that was hoped for. Modern dynamos and problems in recent chemical processes were troublesome to men educated in Latin and Greek and theology. After five years more, that pleasing Oriental government made another generalization, one worth acquiring even at the price paid ; and it was this,—that not only all foreigners could not teach all subjects, but that, if a given subject was to be effectively taught, a teacher must be secured who had fitted himself to teach that particular subject.

It seems to me that we have arrived at a point in our experiments in popular education when certain generalizations are possible. Some of them would seem to be the following :—

One school cannot teach every subject, still less can it teach every subject to every student.

There is such a thing as too much teaching, and there is such a thing as teaching too much.

There are no specifics in education. No subject and no

special method of presenting that subject, and no particular process of training, can be warranted to make an educated man out of an uneducated boy or a trained man out of an untrained boy.

On the other hand, the outcome of our universal human experience goes to show that no man may any longer call any branch of human knowledge common or unclean, or the teaching of it without value to some soul, if one only knew when and how and to whom to teach it.

And, having accepted these generalizations, it would seem to follow that the things to be taught a given class of students will depend, to a degree at least, upon the environment and the life purpose of the students. And so, after all, one comes back to the thought that, since the life in school or in college is not an isolated one, but a part of the life of the world, the teaching in them should have relation to the life in the world. But the question, What teaching shall minister to a particular class of lives? is, after all, a question of individual human judgment. And, having come thus far, I am inclined to feel that I would follow the example of my Oriental friends and ask the assistance of those whose judgment seems, on the whole, the best worth following. And from this standpoint the question of adding to our present public school system that which shall minister to industrial training becomes simply a part of the larger and more important question, What ought that system to be, and how ought it to be conducted?

In a very real sense we are struggling with this question in every American city to-day. We struggle with it perennially in Boston whenever we undertake to elect a school committee. No one who has at heart the true interest of the city can fail to understand the need for the election of capable and honest men to the body which controls and

which conducts our schools. And yet, after all, this is only at best the first step in the problem. The school committee itself is a part of a system which was effective a hundred years ago, but long since obsolete. At some time or other, and in some way or other, we shall need to undertake the serious consideration of what the school shall endeavor to do in the education and in the training of the whole people; and for the solution of this question we shall need to summon to our aid not only those who are intellectually able and intellectually sincere, but those who represent, as well, the convictions and the aspirations of our entire citizenship.

By some such intelligent effort as this, and only in some such way, shall we finally come to a solution of what ought to be taught in a system of popular education; and only by such means shall we arrive at a solution which is consistent, rational, and democratic, and which shall embody in it with a fair perspective that which aims toward a wider culture of the soul and that which aims toward economic efficiency. In any system so devised by thoughtful and representative men, industrial and technical schools, adapted to the needs of those they are to serve, will assuredly find a place.

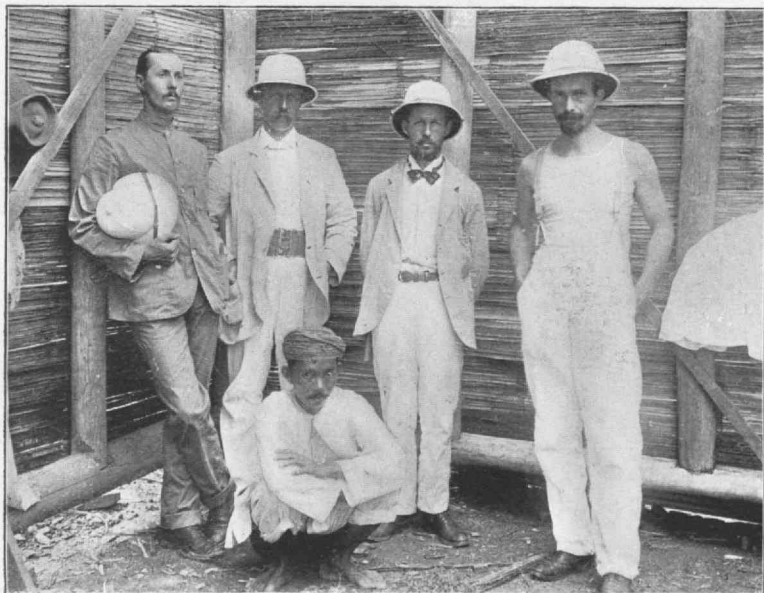
HENRY S. PRITCHETT.

AN ECLIPSE EXPEDITION TO THE ISLAND OF SUMATRA

In May, 1900, the first eclipse expedition was sent out by the Massachusetts Institute of Technology to observe, in Washington, Ga., a total eclipse of the sun. What was seen and accomplished by this party has already been described in a previous number of the REVIEW. In 1901 this same party, having been given an inch, thought it incumbent upon them to take an ell, and had the audacity to consider the conditions attending the next total eclipse of the sun. This eclipse was to occur on May 18, 1901, and to be visible in the Indian Ocean and on the islands of Malaysia. It was to be an exceptional eclipse, the period of totality lasting six minutes instead of the usual two minutes or less. The island of Sumatra furnished the most favorable point of observation. At first it seemed a far cry to Sumatra, but a little investigation showed that, although it was distant from Boston the full half circumference of the earth, it was, as regards ease and convenience of travel, not much more inaccessible than Washington, Ga. It would, however, be a more expensive trip. President Pritchett looked with approval on the work of the previous year, and gave hearty encouragement to the plans for the future. The Corporation appropriated two thousand dollars from the Fund for Scientific Research. A like amount was secured from friends outside the Institute, and thus the financial question was met. It needed only the co-operation of the instructing staff to make the plan completely feasible. We are deeply indebted to those "who had the courage to stay at home," and take upon themselves the extra duties entailed by our absence.

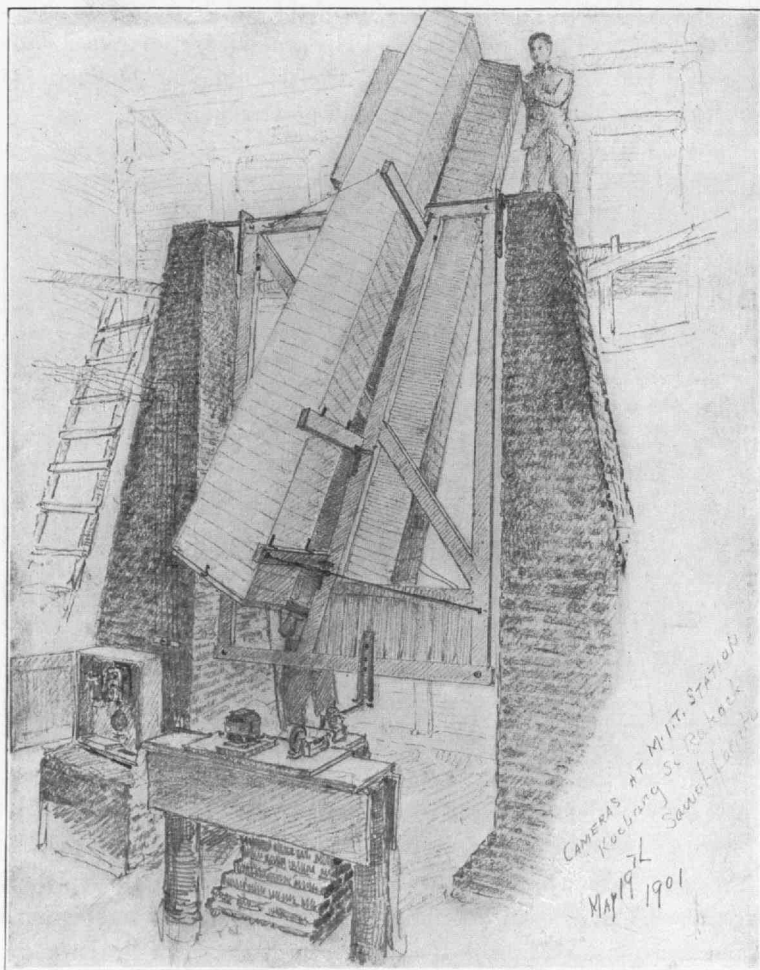
The expedition was placed in charge of the writer, and the members of the party were Mr. George L. Hosmer, Instructor in Civil Engineering; Mr. Harrison W. Smith, class of '97, Instructor in the Department of Physics; and Mr. Gerard H. Matthes, class of '95, Assistant Hydrographer, United States Geological Survey.

The last-named gentleman is a native Hollander, and a graduate of the Civil Engineering Department of the Institute. The securing of Mr. Matthes proved to be one of the wisest moves made in the outfitting of the expedition. His knowledge of the Dutch language and his acquaintance in official circles of Holland did much to pave the way for us in a land of strangers.



“Tech” Eclipse Party while experiencing a “Hot Time” in Sumatra

We left New York February 24 on the North German Lloyd Steamer “*Werra*,” with an equipment of instruments weighing in all about four tons. Through the assistance of President Pritchett the party were able to secure from the Superintendent of the United States Coast and Geodetic Survey the half-second pendulum apparatus, which had already been used extensively in this country and Europe, for determining the relative values of the force of gravity at many different points. We were to swing these pendulums at a new station on the equator, in the island of Sumatra, thus adding



Smith's Cameras for Photographing the Corona

to the data for the determination of the figure of the earth. We were also to swing the pendulums at Singapore, at a station previously occupied by a United States government party using another type of pendulum. We carried with us a magnetometer and a dip circle, which were to be used in connection with a plan for simultaneous observations made in all parts of the world. These observations were to be made under the direction of Professor Bauer of the United States Coast and Geodetic Survey. This part of our outfit is mentioned first because it is important to show that the Institute of Technology was determined that its expedition should do some work which was not absolutely dependent upon the caprice of the weather; and it is interesting to note that the Institute party was practically the only one among the many gathered in Sumatra that made provision for doing scientific work not directly dependent on the clearness of the sky at a specified moment upon a certain day. For photographing the corona Mr. Harrison W. Smith had devised special apparatus, consisting of four cameras. Three were of 11 feet focal length, and one of 40 inches. These were to be mounted in such a manner as to secure great steadiness and uniformity of motion. Two of the lenses in these cameras were loaned to us by Professor E. C. Pickering of Harvard College Observatory, and all were specially ground for photographic work by Mr. Carl Lundin, of Cambridge, Mass. For observing the times of contacts, we transported the five-inch equatorial telescope, the astronomical transit, and the chronograph from the Institute Geodetic Observatory.

By the steamer "*Werra*" the party sailed directly for Genoa, sighting the Azores, pausing a few minutes at Gibraltar and a few hours at Naples on the way. Four days of sight-seeing at Genoa, and then we embarked on the "*Koningin Regentes*" of the Dutch line running direct to Padang. The shifting of instruments at Genoa from one steamer to another was the only hazardous moment in the transportation of our outfit. This accomplished, we had simply to take our ease and "accept the universe," until the wooded hills of Sumatra should loom on our eastern horizon. For twenty-three days the "*Koningin Regentes*" was our home. For company we

had Dutch and English astronomers, Dutch colonists returning to their homes after the usual recuperating trip to old Holland, young men seeking their fortune in a new world, and the annual output of officers and soldiers for the North Sumatra war; but not a solitary globe-trotter or tourist among them all.

The stewards were all Javanese boys, responding to the call of "Jongens." With bare feet and turbaned heads, they glided mysteriously about, and gave an Oriental flavor to the life of the ship. Absolutely ignorant of any words in English and knowing but few of Dutch, they managed in some occult way to anticipate our wants, and made excellent servants and waiters. Most of the Hollanders spoke English; and we were a fairly harmonious ship-load of passengers, indulging in all the games and sports known to a steamer's deck.

We were favored with clear skies as we sailed close to the active volcano of Stromboli and passed through the Straits of Messina. We escaped Scylla and Charybdis, and were treated to a magnificent view of the mighty cone of Mount Ætna. A few hours for coaling at Port Said,—a little is quite enough of Port Said,—then in the night we steamed down the Suez Canal with an electric search-light at our bows, but were soon brought to a halt by the grounding of another steamer on the banks of the canal. For fourteen hours we were tied up within tantalizing distance of Cairo and the Pyramids, but with no possible means of escaping from the ship. To compensate for the loss of the Pyramids, we had the opportunity of experiencing a real sand-storm of the desert. The air was so thick with blowing dust that we had to seek refuge behind closed doors, the dry bulb thermometer at 98 degrees, the wet bulb at 68 degrees. It was of no use to try to pass the time in writing letters; the ink would dry on the pen before it struck the paper. Another night in the canal, and in the early morning we passed out into the arm of the Red Sea. Before long we realized that we were getting into the tropics, and gladly adopted the pajama costume for the early morning hours.

At the island of Perim the Dutch line vessels coal again for the run to Sumatra. Perim! No one would live on that island will-

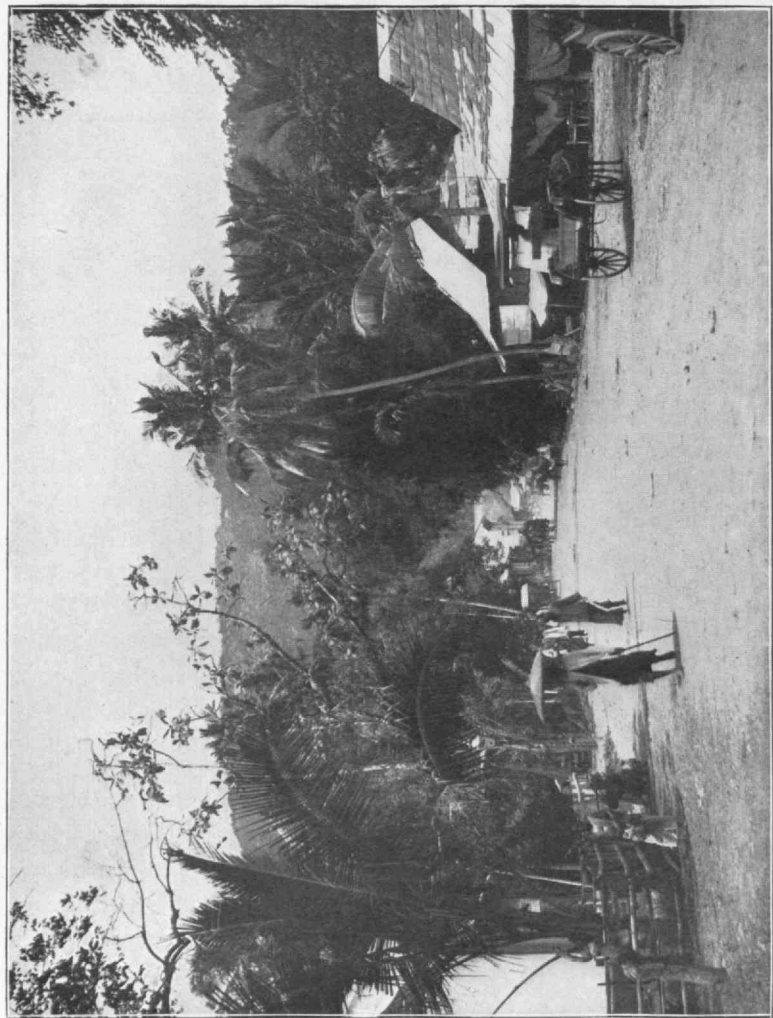
ingly, unless he felt it incumbent to prepare himself for a terrible future. Here for the first time we amused ourselves watching the boys diving for coins thrown from the steamer's deck. We were surfeited with this amusement before we reached home; but these saucy little Somalis were very entertaining, and their cry of "Oho, oho, à la mer," still rings in our ears.

Astronomy was not entirely forgotten on the voyage. We watched the new star in Perseus from the time we left New York, and recorded its fluctuations in brilliancy. We watched for and saw the "green ray" in the rising and setting sun, feasted our eyes on the stars new to us in the southern hemisphere, photographed our shadows when the sun was right above

the mast, and finally, before landing at Padang, regaled ourselves with an astronomical dinner, the menu of which is here reproduced.

At Emmahaven we were astonished to see lying off the pier what at first glance seemed to be a steam yacht, flying the American flag. We learned that this was the United States gunboat "General Alava," formerly owned by Spain, which had brought the Naval and Smithsonian Observatory parties from Manila. They had reached this port by United States transport from San Francisco, and we were beaten by two days in our race around the world,—not to be wondered at, since we gave a good start. On the steamer's deck we were met by the Governor of Sumatra, by Colonel Müller, in charge of the topographical survey of the island,





Street in Padang

and last, but not least, by our most worthy consular agent, Mr. Veth, of the firm Gebrüders Veth, Padang. Whatever may be said about our consular service in general, the consular agent at Sumatra is an honor to his calling. He outdid our wildest dreams of hospitality. After seeing our precious freight on the wharf, he took us in his carriage over the lonely road to the city, and landed us at the new hotel in rooms reserved for our especial accommodation. That was a picturesque ride at night over the dark, jungle-bordered road; and our nerves were kept at the proper tingle by stories of recent tiger raids on "this very spot." Alas! the tigers we imagined that night were the only tigers we ever saw.

At ten o'clock the next morning, according to colonial custom, we reported at the governor's mansion in full evening dress. After a gracious welcome we were introduced to Mr. Delprat, the engineer and manager of the railroad connecting Padang with the coal mines in the interior.

Before leaving Boston, we had selected, after a careful study of maps and astronomical reports, the exact place we wished to occupy with our instruments. It was a spot in this region of perpetual rain where the sun had been seen at noon during every day but one in the previous month of May. It was the village of Solok. Again the Naval Observatory party were ahead of us. They were already located there, and had secured all available accommodations; but fate was kinder than we knew.

On consultation with Mr. Delprat, we decided to go to the last station on the railroad line, up into the hills of Sawah Loento, to the coal mines. Here we found a little hotel newly erected for the accommodation of official visitors, an excellent site for the instruments, and materials and labor in abundance; but, best of all, on the day of the eclipse we were able to photograph the corona, which we could not have done had we been shut in by the clouds at Solok on that eventful day. The twelve hours' journey by rail from Padang is among the choicest memories of our whole tour of the world. This journey and a side excursion to the heights of Fort de Kock and the village of Paja Kombo gave us our glimpses of native Malay life.

What a delight it is, when you go to a tropical country, to find it just as hot as it ought to be, and, when you come to the jungle, to find it just as tangled, rank, and impenetrable as you dreamed it!



Malay Gentleman in Full Dress

As we went farther and farther from the coast line we found ourselves penetrating deeper and deeper into a Malay civilization for which our geographies had not prepared us. Here were costumes and architectural effects far different from the hackneyed cuts in books of Eastern travel.

There are two classes in the Malay civilization,—an aristocracy that commands and a laboring class that obeys. The laborers were feudal slaves until the advent of the Dutch; and now, though straightening up to independence, they still regard with awe their former lords. The Malay as we found him in Sumatra, to whatever class he might belong, had more of individuality and dignity than the average Oriental. He held his head erect, and looked one squarely in the eye, in marked contrast to the fawning of the

Javanese. These Malays of the interior are of pure stock, and have only contempt for their smaller Javanese brothers. With shrewd diplomacy the Dutch avail themselves of this race prejudice. They find an open camp of Javanese convicts in the hills of Sumatra better guarded than a fortress in the island of Java. Let one of

the prisoners try to escape, his freedom is short. Soon he comes crawling back with a string around his neck, goaded on by the taunting and contemptuous Malay.

In the matter of religion the Malay is a sort of easy-going, free-thinking Mohammedan. Not readily aroused to fanaticism, he practises most of the virtues inculcated by Mohammed, and escapes some of the vices of his followers. Without admitting that women



Native Malay Women at Paja Kombo

have souls, he nevertheless allows them a freedom of life unknown in Turkey and Arabia. There is scarcely such a thing as a harem, and there is little multiplicity of wives. When a daughter marries, the husband comes to live in her father's house, to which is added another room, and over it is built another peak to the roof. The style of architecture lends itself easily to indefinite extension in this manner, and the number of these extra peaks beyond the central crescent roof is said to indicate the number of married daughters in that household. Divorce is not difficult; but, when a man takes himself away to another home, the children and all the property

jointly accumulated remain with the former wife. The husband takes with him only what he originally brought to the home. Children, especially the boys, are very attractive little beings, carrying on their games with cheerful faces and infinite good nature. The older people, though grave and dignified, have not the stolid Oriental stare, but let their emotions appear upon their faces. The Malay is lazy, infinitely lazy, enjoys adventure, and delights in travel; he is a most long-winded barterer, but after the sale is quite indifferent to the gains. It is told by one of the traders in Padang

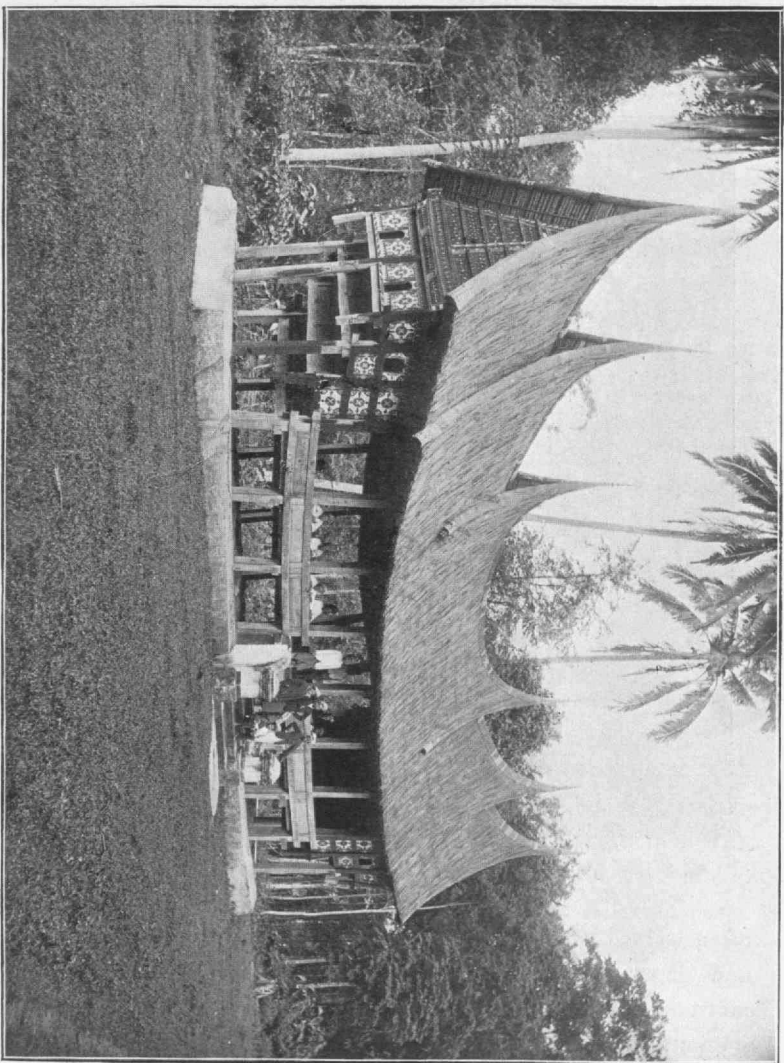


On the Way to Market

that after a whole week of haggling, a back-country rajah returned to his home with only half the cash, on account of a mistake, and the matter was never heard from again. He is subject to violent fits of passion, and treasures up an insult eternally, brooding over small offences until he wipes them out in blood.

Most of our knowledge of

this interesting people before this summer had been associated with terrible tales of "amuck" running. Although we did not see this phase of the Malay character while we were in Sumatra, at Singapore, on the Malay Peninsula, it was a different story. Here in the brief space of ten minutes a frantic Malay, after brooding on a fancied wrong, slaughtered two of his household and then cut down fourteen passers on the street before he could be subdued. The victims of this madman were being brought into the hospital at Singapore on the first day that we entered this building to conduct our series of pendulum observations. When, at the end of two weeks we left Singapore, seven of these unfortunates were beginning to crawl about, the other nine were dead. We saw little of the Malay's traditional cruelty in Sumatra except in his love of cock-fighting. These cocking-mains are his chief amusement. Betting and gambling occupy most of his



Malay Council House, or 'Balei', Upper District, Padang

time. He is a good Mohammedan in the matter of drinking, but smokes infinitesimal cigarettes all the time.

As we travelled from Padang to the hills, we passed long processions of the people on their way to the weekly markets. They



Water Buffalo, or "Kerbau"

often walked twenty miles, the master of the household, his family, and all the servants trudging along in the very early hours of the morning to spend a whole day in traffic and chatter. The women servants carry all bundles, from a bunch of bananas to a bushel of rice upon their heads. This method of travel is not rapid, but might be called a quick express when compared with the journeying by "water buffalo," or "kerbau." The movement of the "kerbau" is the most deliberate thing we ever saw. The wonder-

ful way in which this great, hippopotamus-like creature has adapted himself to the peculiar climatic environment in which his lot has been cast commands one's admiration. There is always a look of contentment in his sleepy eyes; and, when one hears the traditional necessities for his comfort which he has caused to become laws among his masters, one also realizes that he has a quiet sense of humor. He must have two baths a day, no matter what happens. For instance, we start a load of bricks for the building of the piers at our station. After we have gone two miles, the hour of the bath approaches. The bricks are dumped. The "kerbau" is unhitched, led back three miles to the river for a bath, which he takes in a leisurely, luxurious manner, and returns again to the work after a four-hour siesta. Every householder that keeps a "kerbau" has a bath-tub excavated in the mud near the house. If you chance upon him at the moment when he is enjoying this Sybaritic luxury and if you are in a sympathetic mood, he will be sure to bestow upon you a knowing wink as subtle as the smile of Buddha.

Although this observation of the inhabitants was a thing of continuous delight, we really had little time for anything like a real study of the people. We were on the ground none too soon for the necessary preparations. In the erection of our buildings and brick piers the engineers of the railroad and the mine gave every assistance. The mines are operated by convicts, principally from the island of Java; and the Javanese regard this labor a little more unfavorably than a sentence of death. Gangs of these men were assigned to us as laborers. All the materials used for the building were furnished gratis by the Dutch government. All transportation by rail was free. Indeed, there was little else than our board for which we were allowed to pay. To our New England minds all things appeared to be in a state of stagnation during this month of preparation; and we were amused to learn that both Dutch and Malays felt that there was too much haste, and that a collapse would be sure to follow.

Two heavy brick piers, four feet underground and eleven feet above, had to be constructed to support the polar axis of the

camera frame. Then five more brick piers for the transit, the chronograph, and the pendulum apparatus. On account of the rain and the sun, protecting buildings had to be erected, and a non-magnetic shelter had to be placed on the neighboring mountain



Building erected to shelter the Eleven-foot Cameras. Piers for Astronomical Transit and Pendulum Apparatus

to provide for the magnetometer. When these things were finished, the convicts were dismissed.

A set of pendulum observations was made by Mr. Hosmer, and all was in readiness on the day of the eclipse. This day dawned cloudy, but the sky cleared at the time of the approach of the first contact. We recorded the time of this first moment with hopeful spirits. Then, as the real event approached, the sky covered itself with a filmy, tantalizing lace-work of clouds. It was a sky to make an astronomer frantic with apprehension and hope. Nearly six minutes of totality and mental agony now transpired.

Every detail of the programme was carried through with accuracy and despatch; but not until after three sleepless nights of constant work in the development of the photographic plates was the strain of uncertainty removed. For photographic results Mr. Smith had



View from M. I. T. Station, overlooking Rice Fields

one fine picture of the corona (twenty seconds' exposure), an excellent representation of the sun's prominences at the time of second contact (half-second exposure), and several plates of long exposure made with the idea of revealing a possible intra-mercurial planet. Record had been made of the times of the four contacts, and the magnetometer programme was carried out without interruption. The American parties at Solok and the Dutch, French, Russian, and Japanese expeditions were not so fortunate in the weather conditions. Some of the Naval Observatory party at Fort de Kock, the Lick Observatory party at Padang, and the English on the island just off the coast of Sumatra, had quite as good or

even better weather. Near us at Sawah Loento was the English station, in charge of Mr. H. F. Newall, of Cambridge, and two observers from the Naval Observatory party were located close at hand.

As soon as the plates were developed, the packing up began; and in a few days we were back in Padang, ready for the next steamer to take us to Batavia on our way to the pendulum work in Singapore. Everything but the pendulum and the time instruments was sent back from Padang directly to New York. At Batavia close connection was made with the steamers of the "Koninklijke Paketvaart-Maatschappij." After four days we were installed at "Raffles" in Singapore. There was not appreciably much change of climate. We were now about one degree north of the equator. At Sawah Loento we had been $\frac{1}{2}$ degree south. The sun still rose at six in the morning, and set precisely at six in the evening. The change from darkness to sunlight and from sunlight to darkness was just as short and surprising. Flowers and trees were blossoming and fruit was being gathered all at the same time. Centipedes still crawled around on the bath-room floor, and our clothes and shoes gathered a coating of mould over night. In many ways we felt quite at home except that our neighbors were new. Instead of the Dutch and Malays there were now the English, Chinese, Singalese, Hindoos, and Sikhs, with a sprinkling from the rest of the world. In Singapore we ceased to be athletic, yielded to the inevitable, and appeared in public only in the 'rikshaw. Mr. Matthes and Mr. Smith took the next connecting steamer for China and Japan, while Mr. Hosmer and the writer devoted themselves for two weeks to the pendulum. Through the kindness of Mr. R. Symonds Fry, in charge of the Time Service at this port, we were allowed to use the local observatory; and the observations were satisfactorily completed. When the pendulum outfit was packed for its journey home, we breathed the free breath of the irresponsible tourist, and began to seek acquaintance with the other half of the world.

On the steamer "*Bayern*" of the German Mail we started north through the China Sea, and were favored with the first typhoon of

the season. At Hong Kong there was just time to ascend to the Peak, and to realize the depressing effect of a threatening epidemic of plague; then we were off again to North China and the harbor of Wu Sung. At Wu Sung we took a river steamer to Shanghai. While dining at the Astor House in the European concession,



Malay House and Rice Barn

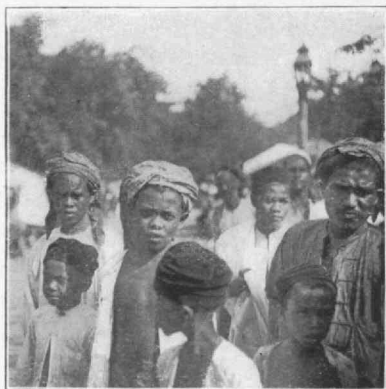
we were met by Mr. Murray Warner, graduate of the class of '92, and through his kindness were introduced to a Chinese mandarin. Mr. Warner and the mandarin showed us over the ancient Chinese town. Here we seemed to see the Chinaman at his worst and best,—at his worst in the narrow, filthy streets and tea-houses, at his best in the Mandarin Club. With many regrets, we left our kind host at Shanghai, and steamed to Nagasaki, where we had our first glimpse of picturesque Japan. Although things change rapidly in our Western country, we can hardly keep pace with the rapid transformation now going on in this land of the “Yankees of

the East." Nagasaki is far from being the town described by early travellers; and any one who visits Japan now with expectations based upon books of travel of even ten years ago will have to go far inland to find the conditions there described. Nevertheless, it is picturesque, strange, and enjoyable enough. In the Inland Sea the sky was overcast, but the mist-shrouded islands were exactly those so familiar in Japanese drawings. At Kobe we found Mr. Smith and all the members of the Institute party who last summer made the trip to Japan. Continuing on to Yokohama by water, we had the great good fortune to catch a glimpse of snow-capped Fujiyama hanging high above the mist-hidden land.

Mr. Fukuzawa, of the class of '88, took us in hand at Tokio; and under his guidance we had a glimpse of the Japanese life of the present day. We could easily see that Mr. Fukuzawa and his newspaper, the *Fiji Shimpō*, were real factors in the growth of "New Japan." It was also a great pleasure to find this energetic and progressive man a loyal son of Tech.

After a delightfully crowded week we took passage on "The America Maru" of the "Toyo Kisen Kaisha" line for San Francisco by way of Honolulu. The voyage was not eventful, and was interrupted only by a half-day's stop at Honolulu, which gave us time for a few short excursions; and when, after seventeen days' sailing, we came through the Golden Gate, we felt as though we must have reached home, although still five days from the gilded dome.

ALFRED E. BURTON.



THE TASK OF OUR ALUMNI IN THE GOVERNMENT SERVICE

The need of educated men in the federal service is more keenly felt and more universally recognized to-day than it ever was before. The problems of a modern government, be they domestic, colonial, or international, require something more than executive ability and faithful work for their successful solution: they demand superior professional education, high ideals, and moral strength of purpose. Nothing has helped us to comprehend this need better than our war with Spain and the difficult problems into which it has led us. Nor has anything of late brought out with more force the dependence of the State upon the citizen, the potency of the individual in the welfare of the community. The State needs educated men, energetic men, honorable men. To quote our new President, "National prosperity depends upon individual character." And, to develop such character and to produce such men, we look to the American universities and schools of science. It is their duty to the State,—a duty which our educators have been foremost to recognize. One need but peruse the addresses of college presidents and the baccalaureate sermons delivered during recent years to know which way the wind is blowing in the educational world. The value of learning is no longer gauged by its sole utility to the individual. The task which our colleges have now set for themselves is, briefly, to turn out a superior class of citizens, men and women whose education will make them a power for good in the community.

It may now be asked: What inducements are there for any of those so educated to enter the government service? What sort of careers does it provide? What kind of surroundings are attached to it? What class of associations may be looked forward to? Will it be wise for the college graduate of the present day to commit himself to it for life, in view of current public opinion concerning government work? Will it be advisable for him even to get his first start in it?

These are questions on which information is very limited : they have never been categorically answered for each profession separately. The majority of those college graduates who have entered the government service since the advent of the new civil service system took their examinations and accepted their appointments at a venture, without having the slightest knowledge of the duties of the life into which they were about to plunge. Yet these men are now probably the best qualified to answer our questions : they understand best our ignorance, having once shared it.

Between the government service on the one hand and the college world on the other there is springing up a co-ordination of purpose and effort of which we as a nation have good reason to be proud. It is now for the alumni of our universities and schools of science to recognize it as their duty, both to the country and to their respective Alma Maters, to help perfect this co-ordination. Nor should this work be confined to individual effort merely : concerted action on the part of the alumni of each college as a body, with the co-operation of their school, is necessary to insure the full success of the undertaking.

Never in our national history was there a more auspicious time than the present for starting such a movement and establishing such a precedent. Never before has partisan feeling interfered less with the proper working of the machinery of government, or the civil service been on a more rational and efficient basis. Never were government positions more attractive to educated men. Nor is this a mere passing condition of affairs ; rather is it one likely to endure.

We have thus far considered the problem in its entirety, embracing all the professions for which our educational institutions prepare men. Let us see in how far this proposed work of the alumni is needed in the engineering and scientific professions, and determine the responsibility which falls to the graduates of scientific schools and colleges.

The public, while generally uninformed upon matters relating to government work and government methods, is lamentably ignorant about anything requiring technical training and education on the

part of the men employed. Considering the atmosphere of commercialism in which we live, this is not strange. To the commercially trained mind, science, as such, is devoid of meaning and, therefore, of interest. Of all members of the community, the man of science is the one whose functions are the least understood, certainly the least appreciated, by his fellow-men. The members of the other professions are more or less in contact with the public, but engineers and scientists work in comparative seclusion. Besides, the majority of men in any community, however enlightened, do not possess that degree of culture, sympathetic breadth, and perspective of human affairs which alone enable one to place the proper value on any scientific work, whether of research or of a practical nature.

The deplorable tendency among men in commercial pursuits is to consider all things in life as so many commodities. Nothing seems worth having or worth doing in their eyes unless there is "something in it." One cannot expect people habitually in this attitude to comprehend the absorbing interest and enthusiasm of the scientific man who is doing original work (which in one sense is unpayable) for a modest salary. These two classes of men have diametrically opposite views of life: hence the commercially trained public is bound to misunderstand and misjudge the men of science.

In addition to this, it is well to remember that government officials, whatever their duties, are held in distrust by the public as a matter of course. There may have been good reason for this once; but the custom still continues on the strength of tradition, although conditions have in the meanwhile changed. The present system of civil service is still very largely misunderstood throughout the country. It makes no difference whether one is in the East or the West, the North or the South, the impression prevails that government offices are "soft snaps," can be had through pull only, are ridiculously overpaid, and that the holders have but the one thought, to grab everything possible before the next administration "decapitates" them. The sight of government men putting in one honest day's work after another, in an earnest and business-

like manner, is a cause of great surprise and general comment. People have grown so accustomed to impute mercenary motives to government officials, and to associate corrupt dealings with government work generally, that our new civil service, the new regime, seems a novelty too good to believe. Evidently, it will take time to dispel the illusions under which our voters are still laboring,—the more so as the entire “spoils system” of old was the direct outcome of the commercial spirit of our nation and is in perfect harmony with it.

If we turn now to the engineers and scientific men of this country, outside of the government's employ, we shall find that even among them there are many who fail to realize the changes wrought by the new regime. They do not as yet fully appreciate the effect it is having upon the classes of work with which they are best acquainted and of which they consider themselves the best judges. The number of these engineers and scientific men who still look down upon the members of their profession in the government's employ, and speak of the work which they are doing with contempt and scorn, is far greater than it should be. It is evident that they have not kept pace with the progress of our scientific bureaus during the last decade. They are not aware of their fast-growing importance and influence. Washington is developing into a great centre of science, second to none in the United States; and it is so, not through its universities and schools, but through the scientific branches of the national government.

The claim is frequently made that a few years of service in a government bureau are sufficient to spoil any young man for work in a private office. They are supposed to take all the “hustle” out of him, and dull the keenness of his business instinct; to destroy his habits of mental concentration and industry, and breed indolence, moral indifference, and shallowness. To those of this opinion a study of the methods used in some of our bureaus at Washington will be both profitable and instructive. The spirit which characterizes the technical work carried on by the government is essentially business-like: few private concerns employ more system and economy. Far from being “proverbially expen-

sive" and inferior in quality, as it has frequently been in the past, the engineering work done by our government has reached a standard such as no contractor who might wish to compete could possibly hope to attain without financial disaster. This has been illustrated time and again in widely divergent branches of work during the last few years. The atmosphere in the scientific bureaus is one of industry and thoroughness,—an atmosphere such as emanates from men who are imbued with a high sense of the responsibility and dignity attaching to their functions, and who are actuated by sincere and patriotic motives. No better school can be found for young men than one in which they associate with such men and breathe such an atmosphere. Contrary to all tradition, the present government position is *par excellence* the training school for young graduates in the scientific and engineering professions. To the query: Is it wise for these young men to get a start in professional life in a government office? the answer is, therefore, unequivocally affirmative.

As to the desirability of the careers which the government service offers, what testimony can be more eloquent and convincing than the character of those men who have attained professional eminence through long years of faithful service to the nation? One might cite illustration after illustration, and enter upon a detailed review of the various scientific branches of the administration and their inducements to college-bred engineers; but this is a task which no one man can hope to accomplish satisfactorily, however intimate his acquaintance with the work of all the scientific bureaus. It is for the leaders in this work, the alumni of our scientific schools, to undertake this task, each man describing his own line of work. Nor should these descriptions confine themselves to the technical parts of the work; they should consider its broader relations and its significance from the world's point of view as well as from the professional one. They should dwell on the social advantages and disadvantages; for the social aspect of a career is quite as important to the college graduate as its technical side. Finally, they should emphasize those qualifications and natural aptitudes which are particularly helpful in the achievement of success in each

branch of the profession. "The right man in the right place" is pre-eminently the man who is naturally fitted for his duty; and such a man, by dint of honest toil, is bound to be successful in his career. Many men are counted among the mediocre, although recognized as earnest workers, because they chance to be employed in work for which they have no aptitude, while in a congenial field they might be eminently successful. Those of our graduates who have hitherto entered the lists of the civil service have, for the most part, done so blindly; and if any have stumbled upon the line of activities to which they are really adapted, it has been purely by accident. It is time that this condition of things should change. The choice of careers should not be a lottery.

It is clear, then, that there is a real need for describing government work and government careers, particularly in the scientific field. There is no class of work done by our government which is so little understood or appreciated by the people generally; indeed, even many men in the engineering professions still entertain erroneous ideas upon the subject. College men, therefore, cannot rely upon information from either of these sources. The Civil Service Commission, with all due respect to the good work which it is doing, is a most unsatisfactory body from which to obtain information, as any one who has asked "stupid questions" has undoubtedly found out for himself. It is therefore distinctly the work of the college alumni to furnish this much-needed enlightenment. Their very position in the community constitutes them the connecting link between the government and the school.

It seems fit that the Massachusetts Institute of Technology should take the lead in this movement. It is one of the best represented schools of science at the capital. Its alumni may be found in every important scientific branch of the service, many of them in positions of great responsibility. The training and education which Technology provides are manifestly of the kind that make men valuable for the government service. Every school which is consistent in its teachings leaves an unmistakable stamp upon its graduates. The one which characterizes Tech men is easily discerned at their gatherings at Washington. They bear

the stamp of four years of labor in class-rooms and laboratories where "bluffs" are out of the question and where work is done with conscientious purpose. This implies seriousness of aim, a high regard for the truth, mental discipline, disinterested devotion to work, habitual industry, and self-restraint. More than that, it stimulates independence of thought, originality, and self-reliance. These are the very qualities most highly esteemed by those in charge of the scientific bureaus.

Our nation is young, and this is an age of rapid progress. Our problems are without number, and often without precedent. They call not only for men who will do faithful work in a business-like manner, but for men who have high ideals and the breadth and initiative needed to inaugurate new methods, found new institutions and anticipate the needs of a nation whose development is without parallel. In commerce and industry we stand foremost; yet, unlike most European States, we have no Department of Commerce and Industry. We are unrivalled in our mineral wealth; yet there is no Department of Mining. Our very government is still in a process of construction. It is a most attractive field for men of talent and exceptional ability.

This paper may seem to paint the government service in rosy hues exclusively. Doubtless there are exceptions to the statements made, but it is significant enough that they are exceptions. We all know of the darker tones in Uncle Sam's portrait,—all of us, at least, who have witnessed the transition from the old to the new regime,—but let us remember that, if the government service stands in need of improvement, we ourselves are the ones to improve it.

FRANÇOIS E. MATTHES, '95.

EDITORIALS

In the last number of the REVIEW a reprint of an early document of the Institute showed that the "Back Bay" was a subject for contention nearly fifty years ago, and it has remained one ever since. Even at that early date, when the Back Bay was an aqueous possibility rather than a dusty actuality, there seems to have been some conception of its æsthetic possibilities; but, while some of these possibilities have been realized in the Back Bay Fens, the inherent beauty of the Charles River Basin remains still unutilized. In spite of human neglect, however, nature at certain times puts over the mud flats a veil of water, and over the shamefully neglected back alley of Beacon Street a veil of mist, through which heterogeneous and (from this water side) shabby old Boston becomes glorified into a city of cloudland, a city more beautiful than Venice herself. The skill of the engineer and the landscape architect needs only the backing of united public sentiment to make this dream city a reality and this shabby "Back" Bay an exquisite foreground for both Boston and Cambridge.

A glorious opportunity toward this desirable end was lost, of course, through the fact that the Harvard Bridge was built before public opinion had been sufficiently awakened; but the new Cambridge Bridge was delayed long enough to enable its distinguished engineers and architects to make it the first step in that process of adornment through which Municipal Beauty, like a second Venus, will eventually emerge from the waves of the lower Charles.

The REVIEW is most fortunate in being able to open its initial number of 1902 with an article upon this new Cambridge Bridge, containing the first historical sketch given to the public of the legal and legislative obstacles successfully surmounted by the Bridge Commission in the execution of this notable work.

The construction of this bridge, the foundations for which are already well under way, bids fair to mark a distinct advance in

municipal construction. Boston has long been renowned for the excellence of its engineering works, its Metropolitan Sewerage System, its Metropolitan Parks, its Metropolitan Water Works, and its other municipal undertakings; yet this bridge is, to a certain extent, unique, for beauty of design and harmony with future surroundings have had no less influence than economic and engineering considerations.

The two cities which are to be benefited by this structure — not to mention the thousands from other places who will view it daily — are certainly to be congratulated upon the liberal spirit with which the commission has approached this work. It is, however, upon the ability of the engineers and the architects that the excellence of the work must depend, since they are primarily responsible for the conception and execution of the design; and Technology men especially have reason to feel a very keen interest in the work, since a large number of Institute men have been concerned in its execution, as appears from the following list: —

William Jackson, '68, Chief Engineer.

Edmund M. Wheelwright, '75, Architect.

James W. Rollins, Jr., '78, of the firm of Holbrook, Cabot & Daly, contractors for the piers.

Engineering Office Force

Frederic H. Fay, '93, Assistant Engineer.

Sturgis H. Thorndike (Harvard '90), '95, Assistant Engineer.

Harry F. Sawtelle, '98, Draughtsman.

Edward C. Sherman, '98, Draughtsman.

Engineering Field Force

Louis F. Cutter, '86 (in charge of borings).

Frederic P. Spalding, '77 (in charge of the temporary bridge).

George E. Harkness, '96, Assistant Engineer (on construction).

Frederick M. Leonard, '94, Transitman (on construction).

Architectural Force

Winthrop D. Parker, '95, Draughtsman.

Edward H. Pritchard, '94, Draughtsman.

Edward S. Spring, '97, Draughtsman.

The Washington Society of the M. I. T., though among the younger of the alumni associations, is one of the most active, possessing a large and growing membership of earnest and enthusiastic "Tech" men. In addition to the good work that, in common with the other alumni associations, it is doing for the Institute, it proposes to perform a more specific service by publishing in the REVIEW a series of articles, by Institute men connected with the various departments of the government service, upon that special, and yet broad, field of scientific work. The dignity of government service was, it will be remembered, the dominant note of the inauguration of President Pritchett; and in these halcyon days of a classified civil service it would seem that no more honorable or useful career could open before a Bachelor of the Institute than is to be found in a scientific bureau controlled by the federal government. How true this is Mr. Matthes points out in his enthusiastic paper in another part of the REVIEW, and his words will doubtless be emphasized by the later special articles, prepared under the supervision of a special committee of the Washington Society, which the REVIEW will have the good fortune to present in a number of succeeding issues.

The most discouraging aspect of amateur unpaid work, such as the Committee on Publication has been drafted by the Association of Class Secretaries to perform, is that the product of the labor appears to be—at least in blue and perplexed moments—as a voice crying in the wilderness: it brings no response excepting the neutral, and in many cases somewhat tardy, echo of a dollar bill. These subscriptions, however, may signify nothing more than a perfunctory wish to give countenance to the Association and its laudable, but deadly dull, achievement. But any one who has read the wonderful first chapter of "The Heart of the Ancient Wood" has learned that the silent wilderness is peopled by myriad living things, each with intent eye and keen ear following the slightest movement of the intruding traveller. And as, to such a lonely wanderer, the faintest rustle or squeak of this invisible host is a comfort and a

heartener, so to the Review Committee even the rare growl of a subscriber is welcome, as indicating that the progress of the periodical is not wholly unobserved. Unwise as it would be to print the growls, it may not be unbecoming to make audible beyond the committee-room some of the voices of those appreciative friends, whose words are indeed manna to the committee's fainting souls. Writes an older graduate in the distant West: "The TECHNOLOGY REVIEW is *all right*. Count on me as a subscriber for life. Every man ever at the M. I. T. should have it." And this from a younger man in Pennsylvania: . . . "I hardly know what I should do without it. The REVIEW deserves the best possible financial support, just as it does the personal and collective thanks of all our alumni." A third subscriber . . . "cannot refrain from expressing appreciation of the marked and constant improvement in the magazine, not only in its mechanical appearance, but in its subject-matter; and I think the conduct of the paper worthy the cordial support of all graduates and former students." And even the most modest member of a publication board could not refrain from making public such words as the following from an enthusiastic New York alumnus: "I believe that it is destined to do a great work for Tech. Everybody wants it: it heals the sick, cures the infirm. My uncle, stone-deaf from youth, says that he has learned so much about the Institute in the TECHNOLOGY REVIEW that he is going to send his son to Tech. Another man, blind as he can be, says that he has taken the REVIEW for a year, and can now see clearly which is America's greatest technical school. No Tech man should consider a year well spent unless he has paid his next year's subscription to the REVIEW."

GENERAL INSTITUTE NEWS

CORPORATION NOTES

The two hundred and ninety-first meeting of the Corporation was held at the Institute December 11, 1901; and the annual reports of the President and the Treasurer were presented. The report of the President was devoted mainly to emphasizing certain urgent needs of the school, the recital of departmental progress being reserved for subsequent publication. The main features of the Treasurer's report were the statement of increased tuition receipts, amounting to \$21,000,—more than offset, however, by increased expenditures,—and the enumeration of gifts and bequests resulting in a net increase in the Institute's property of \$116,658.04. The receipts enumerated include \$20,000 additional from heirs of the late Edward Austin; \$50,000 from the late Robert C. Billings for scholarships; \$50,000 from the estate of the late Henry Saltonstall, long an active member of the Corporation; \$10,000 from Mr. George A. Gardner for the new electrical engineering building; and gifts for other special purposes from ex-President Crafts, Mrs. Rogers, Mr. Francis Blake, and Mr. Charles C. Jackson. The closing paragraphs of the Treasurer's report are of much significance:—

Looking back ten years, we find that during that time the receipts from students' fees and scholarships have increased about \$60,000; but during the same period the expenditures have increased nearly \$139,000. This has been due in great part to the increased number of students and to the increased demands for more advanced and more varied educational opportunities. The development of technical work and education has made necessary an amount of instruction and of laboratory apparatus far greater than that which sufficed ten years ago.

The gifts to the Institute during this period have been very generous, so that its total property has increased from \$1,364,684.98 to \$3,456,099.46, of which sum, however, nearly \$1,400,000 is in real estate used by the Institute itself, and on the balance a much lower rate of return must now

be accepted than that which was received ten years ago. In considering these amounts, the public must bear in mind that a very large proportion of this property is held for special purposes,—notably, scholarships; and such funds, while doing a most beneficent work for the students, do not enable the Institute to meet its general expenses, since the expense of each student is considerably greater than what he pays. To raise the fees would carry them much beyond those charged in other educational institutions, and would, moreover, bear very hardly on a class of men whose work is of such high order as to entitle them to consideration both from the Institute and from the public.

Judging from the figures for this year, the increase in the number of students in the near future is likely to be very large; and there is imperative need of a large increase in funds to provide the necessary buildings and the necessary instruction.

The poverty of the Institute is the result of the excellence of its work and the reputation which it has attained. The alumni have shown a most loyal interest by contributing \$100,000 toward the Walker Memorial Building, of which sum \$30,000 has been already paid; but the number of Institute graduates who have been long enough at work to enable them to contribute largely to the support of the Institute is comparatively small, and it is necessary to rely still upon the generosity of the general public to enable the Institute to accomplish for the community the splendid possibilities that are opening before it.

Appointments presented by the Executive Committee were confirmed; and the degree of Bachelor of Science was awarded to Albert Charles Dart, Jr., in the department of Mining Engineering and Metallurgy, and to Horace Edwin Hildreth in the department of Civil Engineering. The appointments included the following: Eugene Stillman Foljambe, '01, assistant in machine tool work, James Chadbourne Woodsome, '01, assistant in Mechanical Drawing, Edward Everett Bugbee, '00, assistant in Mining Engineering, William Stark Newell, '99, transferred from the department of Mechanical Engineering to that of Naval Architecture.

The following from the President's report to the corporation deals with some of the most pressing questions at the Institute:—

“Two years ago there were less than 1,200 students in the Institute: to-day there are more than 1,400. In the present first-year class there are

439 students. The increase in numbers of the last two years would in itself constitute a good-sized technical school. These students are drawn in large numbers from those classes which are welcomed most gladly, a number are graduate students, a still larger proportion come from the West and South, while ever larger numbers come from abroad. Nevertheless, when one reflects that each regular student costs the Institute about \$100 more than he pays, one realizes that this growth, gratifying as it is in one way, imposes upon us a constantly heavier burden, and demands constantly increasing resources. Should each former student return to the Institute the difference between his actual payment and the cost of his education, the sum would prove an ample endowment for the present.

"Not only is it true that increasing numbers mean increasing cost, but we have already reached the limit of our buildings in the matter of instruction. For instance, instruction in chemistry, physics, and in electrical engineering is given in the Walker Building, in addition to certain instruction in modern languages. At the present time there are being instructed in this building 684 men in chemistry, 848 men in physics, 89 men in electrical engineering, and a large number in modern languages. Even these numbers represent the number left after a careful culling out of students who under ordinary conditions would be allowed to take these subjects, and the cutting down of classes to the smallest possible numbers. In addition some relief has been afforded by the use of rooms, though ill-suited to the purpose, in an adjoining street; but at this moment every possible amount of space is being utilized for every moment of the day.

"For next year, when the present first-year class goes into the second year, and is followed by a similar class, I do not know how we shall be able to provide for them. The problem is one which is of so great importance that I cannot overestimate its significance and the necessity of an immediate solution.

"Foreseeing somewhat of this condition, the Executive Committee has recommended the erection of a building on the Trinity Place ground for electrical engineering, and the equipment of that building with modern appliances for the teaching of that subject. But since the opening of the present term it is evident that even the removal of electrical engineering from the Walker Building would give scarcely momentary relief, and that really to deal with the problem effectively, and to afford the provision for chemistry which is urgently demanded, it is necessary to move both the department of Physics and the department of Electrical Engineering. Furthermore, additional investigation of the subject shows the great economy of keeping these departments in close contact.

“To provide for the department of Electrical Engineering alone would involve an expenditure for building and apparatus of about \$275,000, while to erect a building capable of providing for both departments would cost about \$350,000.

“A most generous beginning has been made toward this new building by a subscription of \$50,000 from the sons and daughters of our late colleague, Mr. Augustus Lowell, and an additional subscription of \$10,000 from Mr. George A. Gardner—in all \$60,000. I cannot but believe that if the absolute need of the Institute were known, and if at the same time those who are interested in young men in America were aware of the opportunity afforded here for ministering to students from all parts of the United States, means would be provided without delay for meeting these immediate demands. The Institute of Technology has reason to be proud of what it has accomplished with modest financial resources. It would be an extraordinary condition of affairs if the response by the youth of the country to the instruction offered here should be so large that it should outstrip the facilities provided for that work.

“Two courses seem open to us in meeting this problem. One is to cut down the number of students to the measure of our present working facilities by imposing such arbitrary conditions as may limit the number of those who can enter. Should this plan be adopted, it would probably be well to follow the course adopted in business firms which undertake to limit their responsibility, and to call ourselves the Massachusetts Institute of Technology (limited).

“The other way of meeting this problem is, while maintaining all proper standards of entrance requirements, and even advancing these standards, to make the facilities for instruction so generous and so complete that the Institute of Technology may lead the world in the teaching of applied science, and that it may continue to draw to itself in yet larger numbers the students from the whole country and the whole world.

“I have found, now and again, some question as to the wisdom of opening without reserve our facilities to these students. Some ask: Why encourage students from Texas and from California, from England or from Australia, to come to the Institute of Technology? Why should Massachusetts supply the facilities for training those who may in the near future be using the skill thus gained in the service of her industrial rivals, domestic or foreign?

“Let me express the conviction that no institution of higher learning which undertakes to limit its ministry to its own section or to its own community is worthy of the highest devotion. And no man is worthy to direct such an

institution who is willing to consider the problems of education from the sole standpoint of the upbuilding of the influence and power of the particular institution which he represents. College spirit and college devotion in the United States mean in too many instances devotion to the interests of a particular institution, and not a devotion to the cause of education of the State, of the nation, and of the world. I believe profoundly that an institution which seeks to serve the purposes of the widest education and of the highest training best serves its own community when it serves best the citizens of the whole country and of the world. The attendance of students from abroad is the best barometer we have of our own alertness and our own fitness. And I am sure that, when the Institute of Technology ceases to serve as freely the student from abroad as the student from Massachusetts, when it ceases to attract to its lecture-rooms and to its laboratories the student from Texas and the Carolinas, from Washington and California, from England and from Australia, from China and Japan, it will cease to serve efficiently the student from New England and the student from Massachusetts. After all, a great institution of learning is like a great magnet. Its power grows in proportion as it attracts particles to it. Its power wanes when it ceases to carry its full load."

FACULTY NOTES

An important matter of Faculty business this fall has been the determination of the attitude of the Institute toward the principle of college co-operation in the conduct of entrance examinations. One year ago the colleges of the Middle States and Maryland organized a college examination board for the conduct of entrance examinations at a great number of points. Only Columbia and Barnard, however, transferred to the board the conduct of the home examinations. The plan appears to have been carefully worked out and administered, and to have given much promise of future usefulness. This fall the question of the establishment of a similar board has been canvassed by representatives of the colleges of New England. Considerable difference of opinion appeared, and only negative results were reached. On the other hand, the Middle States examination board has undertaken to extend its scope by inviting the participation of colleges in New England. It seems at present probable that the Institute will

accept the invitation, but with no intention of surrendering full control of its Boston examinations.

The attention of the Faculty has again been called to the matter of the Christmas vacation; and for the present year the plan has been tried of suspending exercises at Thanksgiving for one day only, and at Christmas for the entire week. It is probable that this plan will be made permanent.

It was mentioned in the last number of the REVIEW that Professors Cross and Goodwin had devoted a considerable portion of the summer to visiting European laboratories of Physics and Electrical Engineering, and that Professor Puffer had just gone abroad on a similar errand. Professor Puffer has now returned, having visited a large number of laboratories and electrical plants at London, Manchester, Birmingham, Paris, Berlin, Munich, Karlsruhe, Aachen, Milan, and Naples. The plans for the new building will profit much by these studies of members of the department.

CHANGE IN ENTRANCE REQUIREMENTS

After careful consideration, the Faculty has finally voted to increase the entrance requirements by including elementary French and elementary German, which are at present alternative. This change will take effect for students entering after 1902. The main reasons for this change are the fact that the time thus released for other purposes is much needed in our courses, and the belief of the Faculty that elementary language instruction is more in place in the secondary schools than in the Institute. While equivalents—for example, advanced French or advanced German—will not be formally accepted, special pains will be taken to accommodate schools and applicants for whom immediate conformity to the new requirement would involve serious hardship. The following statement is included in the announcement of the changes to secondary schools:—

Though we do not wish to establish a numerical rating for examination subjects, it should be borne in mind by teachers that the action of the Faculty on records of entrance examinations will be based as heretofore on all avail-

able evidence of fitness for our work, and that such evidence is expected to consist largely of the examination papers in mathematical subjects. An applicant is accordingly less likely to be rejected for conditions in language requirements than for an equal number in mathematics. In other words, it is not to be inferred from this change in entrance requirements that we desire to place any additional emphasis on the importance of modern languages as preparation for the Institute. Our present test of *fitness* as distinguished from *attainment* is not intended to be modified in character or scope.

PUBLICATIONS

New department circulars are in preparation in Mining Engineering, Biology, and Naval Architecture, a preliminary edition of the first having been prepared for use at the Buffalo Exposition.

The new catalogue now in press will contain announcements of special interest in regard to graduate courses. Definite schedules are offered for the first time in Mining Engineering, Chemistry, and Electrical Engineering.

In mining and metallurgy an advanced course is offered, including two options,—one mainly in mining, the other in metallurgy, both including additional work in mechanical and electrical lines. The mechanical engineering subjects include mechanism and steam engineering and drawing. The instruction in electrical subjects aims to teach systematically the electric transmission of power, and enables the student to judge intelligently of electrical power problems. The mining option includes work in surveying, railroad field work, and drawing and structures. The metallurgical option includes electro-chemical work, electro-metallurgy, and the microscopic examination of metals and alloys. In both options the student is required to spend much time in the mining and metallurgical laboratories and to work out new problems. The graduate course in Electrical Engineering includes advanced theoretical work in polyphase transmission, advanced work in electrical testing and in direct and alternating currents, courses on the design of stations and distribution systems, on heat measurement, and electro-chemistry. The course in Chemistry includes two options, advanced inorganic and theoretical chemistry and chemical research being common to both. The

first option includes, in addition, work in mechanical and electrical lines with advanced industrial chemistry; the second is occupied mainly with mathematical and electrical subjects.

Moreover, the course for naval constructors, which also appears for the first time, has the character of a graduate course in its final year, and will, like the others, lead to the degree of Master of Science.

It is probable that the schedule of a graduate course in architecture will be added at an early date; and there are, in fact, five students who are candidates for the master's degree in that department in the present year.

FELLOWS AND GRADUATE STUDENTS

The full list of fellows and graduate scholars for the year is as follows: —

Fellows

NAME.	HOME.	RESIDENCE.
Blanchard, Arthur Alphonzo S.B., Massachusetts Institute of Technology. Austin Fellow.	Newton Centre	Leipsic, Germany.
Brown, John Wesley. S.B., Massachusetts Institute of Technology. Austin Fellow.		Heidelberg, Germany.
Chapin, Lewis Paul Ch.E., University of Minnesota. Austin Fellow.	Boston	Leipsic, Germany.
Coffin, Joseph George S.B., Massachusetts Institute of Technology. Austin Fellow.	Boston	Worcester.
Sherrill, Miles Standish S.B., Massachusetts Institute of Technology. Austin Fellow.	Boston	Leipsic, Germany.
Thompson, Maurice de Kay, Jr. S.B., Massachusetts Institute of Technology. Savage Fellow.	Boston	Zürich, Switzerland.
Walton, James Henry, Jr. S.B., Massachusetts Institute of Technology. Austin Fellow.		Heidelberg, Germany.

Graduate Scholars

NAME.	HOME.	RESIDENCE.
Birks, Arthur Henry S.B., Massachusetts Institute of Technology.	Peoria, Ill. . . .	17 Blagden St.

NAME.	HOME.	RESIDENCE.
Henrich, Louis Richard . . .	<i>Buffalo, N.Y.</i>	2 Claremont Park.
S.B., Massachusetts Institute of Technology.		
Holford, William Gordon . . .	<i>Hazardville, Conn.</i>	96 Pembroke St.
S.B., Massachusetts Institute of Technology.		
Hyde, George Taylor . . .	<i>Montreal, Quebec</i>	264 Newbury St.
S.B., Massachusetts Institute of Technology.		
Kattelle, Walter Roby . . .	<i>Auburndale</i>	Auburndale.
S.B., Massachusetts Institute of Technology.		
Lawrence, Ellis Fuller . . .	<i>Cambridge</i>	Cambridge.
S.B., Massachusetts Institute of Technology.		
Morse, John Henderson . . .	<i>Corsicana, Tex.</i>	444 Mass. Ave.
B.A., University of Nashville.		
Pearse, Langdon . . .	<i>Boston</i>	317 Walnut Ave.
S.B., Massachusetts Institute of Technology.		
Phalen, William Clifton . . .	<i>Gloucester</i>	Cambridge.
S.B., Massachusetts Institute of Technology.		
Puckey, Francis Willard . . .	<i>Wilkesbarre, Pa.</i>	16 Berwick Park.
S.B., Massachusetts Institute of Technology.		
Swanton, Henry Aiken . . .	<i>Roxbury</i>	1 Regent St., R.
S.B., Massachusetts Institute of Technology.		

SOCIETY OF ARTS

The following subjects have been presented during the fall before the Society of Arts: "The Olympia," a general description of this famous ship and a "Discussion of the Development of Cruisers during the Past and the Tendency of Future Progress," by Naval Constructor William J. Baxter, U.S.N.; "Present Condition of American Railroads as compared with the Period of Depression, 1893-97," by Professor William Z. Ripley, Expert Agent on Transportation, United States Industrial Commission; "The Importance of Catalytic Agents in Chemical Processes," by Professor Arthur A. Noyes; "The Development of the Nernst Lamp in America," by Mr. Alex. J. Wurts, Manager of the Nernst Lamp Company; "The Development of Locomotive Boilers," by Mr. Cornelius Vanderbilt; "The New Star in Perseus," by Professor George E. Hale.

The following papers will be presented: January 23, "Utilization of Electricity in Mines," by Mr. Calvin W. Rice; February 13, "Isthmian Canal," by Professor W. H. Burr, member of Isthmian

Canal Commission; February 25, "Engineering in China," by Mr. William B. Parsons, Chief Engineer of the New York Subway.

GENERAL NOTES

On December 20, President Pritchett gave an address before the Technology alumni in Cincinnati and vicinity. On the following evening he spoke before the Commercial Club of that city on "Technical Education."

Governor Crane has appointed as commissioners to determine and report upon the feasibility and advisability of constructing a dam across the Charles River between Cambridge and Boston the following: Dr. Henry S. Pritchett, Colonel S. M. Mansfield of the United States Engineer Corps, and Mr. Richard H. Dana.

The jury at the Pan-American Exposition awarded to the Institute of Technology a gold medal, but on account of President Pritchett being Superintendent of Awards the Institute was *hors concours*.

At its Bicentennial Celebration, Yale University conferred the degree of LL.D. upon Dr. Pritchett.

Professor Dewey has been appointed an expert special agent of the census, to prepare a report on wage statistics in connection with the census reports on manufactures and mechanical industries.

THE UNDERGRADUATES

ADDRESSES TO STUDENTS

With a view to supplementing the formal instruction of students by addresses from public men of distinction, President Pritchett has secured this fall brief talks from Dr. Lyman Abbott, editor of the *Outlook*, and Rev. Edward Everett Hale. No one who had the good fortune to be at either of these addresses could doubt

their high value. In spite of the fact that Dr. Abbott's address was given between 1 and 1.30 P.M., involving for many the sacrifice of lunch, Huntington Hall was filled with a most interested and responsive audience, the largest of its kind which Dr. Abbott had ever addressed. His effective presentation of the meaning to every student of the broader human interests of life, while given with a true lightness of touch, did not fail of marked effect.

The attendance at Dr. Hale's talk was even larger, and appreciation of his homely good sense was most manifest. In this instance the experiment was tried of gaining the necessary time by postponing all afternoon exercises by a half-hour. Such addresses, in addition to their benefit to the individual student, are perhaps the best present means for arousing and intensifying the sentiment of solidarity in the whole student body. It is hard to believe that any student attending one of these meetings can thereafter think of himself as wholly independent of the other fourteen hundred.

TECHNOLOGY FIELD DAY

We are indebted to the *Tech* for the following account of Field Day:—

The events of the first Technology Field Day were run off on the afternoon of Tuesday, November 19, at Charles River Park. The day was bleak and uncertain, but the attendance was large; and the spirit with which the classes entered the competition fully offset any defects in the weather. The Freshman Class was victorious, winning both the football game and relay race, gaining a total of six points against the three points of the Sophomores, who were successful in the tug-o'-war.

Football Game

1905,—16.

1904,—0.

The Sophomore and Freshman football teams were probably the best class teams that have ever been turned out since the beginning of class rivalry. This was partly due to the fact that there is no

'varsity team this year to take the best players for the first team. The game was well fought from start to finish, in spite of the Freshmen's immediate show of a strong offensive game.

The Freshmen played a formation similar to Yale's tackles back, with great snap and push. The inability of the Sophs' line to break through prevented the play from being stopped until a substantial gain had been made. The novelty of the play, together with the originality of Newton, kept the opposing ends from doing much damage to these brilliant end runs. The Sophomore defence near their own goals was commendably strong, and possibly saved them two touchdowns. Lang advanced the ball the most for the Sophomores, and kicked excellently. Card and Roberts were strong factors in the defence. The Freshman team play was a most praiseworthy feature of the game. Newton and Hill for '05 showed a thorough knowledge of the game, and Hill's goal from the field and his punt after a bad pass were especially thrilling.

Summary

'05.	'04.
Strickland, r. e.	l. e., Smith
Pease, r. t.	l. t., Thompkins, Cockrell
Tuck, r. g.	l. g., Anderson, Tompkins
Kenway (Captain), c.	c., Raymond
Grady, l. g.	r. g., Hunter
Lindsay, Guionlock, l. t.	r. t., Roberts
Boggs, l. e.	r. e., Barry
Hill, q. b.	q. b., Card
Fuller, Goldthwaite, Mackie, r. h. b.	l. h. b., Lang
Taylor, l. h. b.	r. h. b., White (Captain)
Newton, Deane, f. b.	f. b., Metcalf

Score: '95, 16; '94, 0. Touchdowns: Newton, 2. Goal: Newton. Goal from place kick: Newton. Referee: Hooker, '02; Umpire: McCarthy, '02. Linesmen: Nettleton, '03; Nash, '02. Timer: Fred Wood, B. A. A. Time, 15 m. halves. Attendance, 2,000.

The relay race was run off between the halves of the football game, and proved to be one of the most exciting events of the day. Twelve men ran on each side, each man running half a lap. The

track was slippery and made the footing bad, but did not seem to seriously interfere with the running. The Sophomores took the lead at first, and held it for three laps. The sixth man, Jewett, on the Freshman side, quickly passed his man, and soon gained a big lead. The next Freshman upheld most of the lead gained by Jewett. The last man faltered badly at the finish, and came across the line but a few yards ahead of his competitor. 1905 thus gained two points. Jewett practically won the race for his team, although several of the other men did splendid work.

Following are the members of the relay teams: —

Freshmen: G. E. Turner, Abbott, Webster, Lord, Craig, Jewett, Riley, L. E. Turner, Steele, Snow, West, and Clark.

Sophomores: Haynes, Underhill, Doyle, Bouscaren, Ovington, Saville, Flinn, Crowell, Worcester, Stebbins, Needham, and Hurley. Time of relay race, 7 m. 9 4-5 s.

Tug-of-war

Although already beaten, both in the football game and the relay race, the Sophomores made a plucky stand in the tug-of-war, and by sheer strength pulled the tape across the line in one minute and fifty seconds. In every way it was a clean and creditable victory for the Sophomores. Below is a list of the men on the opposing teams: —

'04.
E. O. Hiller (Captain)
G. W. Sanborn (Manager)
1. Grant
2. Galusha
3. Carhart
4. Clough
5. Crary
6. Hadley
7. Porter
8. D
9. Hiller (Captain)
10. Eastman
11. Fellows

'05.
T. Green (Captain)
A. J. Amberg (Manager)
1. Seaver
2. Stevens
3. McLeane
4. McManus
5. Schonithal
6. Josslyn
7. Page
8. Perry
9. Upham
10. Halstead
11. Thomas

12. Sanborn (Manager)	12. Bryant
13. Kemper	13. Prentiss
14. Richardson	14. Lambie
15. Kramer	15. Brown
16. Hoy	16. White
17. Adams	17. Green (Captain)
18. Homer	18. Rogers
19. Hamilton	19. Field
20. Baker	20. Curtis
21. Harnett	21. Allen
22. Yoder	22. Morrill
23. Wood	23. Boynton
24. O'Connor	24. Ayers
25. Rupf	25. Bonie

Referee: F. H. Briggs, '81. *Judges:* C. W. Kellogg, '02; A. L. Collier, '02; G. B. Wood, '03; F. W. Davis, '03. *Official Time-keeper:* F. W. Wood. *Starter:* Brown.

Summary of Points

'05.	Points.	'04.	Points.
Football Game . . . 4		Tug-o'-war . . . 3	Total 3
Relay Race . . . 2	Total 6		

The Field Day officials were:—

FOOTBALL.—*Referee:* H. K. Hooker, '02. *Umpire:* C. E. McCarthy, '02. *Linesmen:* H. B. Pond, '02; V. I. Nettleton, '03.

RELAY RACE.—*Referee:* J. L. Batchelder, Jr., '90. *Judges:* H. L. Morse, '99; W. W. Garrett, '01; R. L. Frost, '02; R. V. Brown, '02. *Inspectors:* K. Grant, '02; C. A. Sawyer, '02; J. R. Jones, '03; H. S. Baker, '03; G. D. Wilson, '03; H. T. Winchester, '03.

TUG-OF-WAR.—*Referee:* F. H. Briggs, '81. *Judges:* C. W. Kellogg, '02; A. L. Collier, '02; G. B. Wood, '03; F. W. Davis, '03.

Official time-keeper for all events, F. W. Wood.

The following were marshals of the day:—

1902.—N. E. Borden, E. Le R. Brainerd, G. Bright, Jr., M. Brodie, H. B. Canby, L. S. Cates, A. E. Lombard, A. E. Nash, K. T. Stow, R. S. Williams.

1903.—L. H. Underwood, P. R. Parker, H. Crosby, G. W. Swett, G. B. Seyms, W. H. Whitcomb, G. M. Harris, R. H. Howes, F. A. Olmstead, G. H. Gleason.

FIELD DAY DINNER

On December 16 a dinner was given in honor of the athletic teams which competed in the recent Field Day events and to students prominent in athletics. They were invited by the Technology Club to meet President Pritchett and the members of the Advisory Council on Athletics, and more than two hundred were present.

“During the evening the handsome trophy cup, a massive design in silver, was presented by President Pritchett to Norman Lombard, president of the class of 1905. This was the cup won by that class in its victory on Technology Field Day. At the conclusion of the evening’s exercises the cup was filled to the brim with cider, and passed around the table, President Pritchett first drinking a toast to the health and success of athletics at Tech. The speakers were President Pritchett, James P. Munroe, president of the Technology Club, Samuel Cabot of the Corporation, and others. Mr. Cabot was given an ovation as the one who had presented the trophy cup, to serve as the badge of victory to the winning class in Field Day contests for the next fifty years.”

President Pritchett said in part : —

This splendid loving-cup — the gift of a former student of the Institute, who has shown his interest by many thoughtful acts — is one of the most interesting trophies which could be offered as a badge of victory in our class contests. I deliver it into the keeping of the class of 1905, with the hope that it may be valiantly defended and bravely held, and that, when its fifty years of service have filled up the wreaths which are to hold the names of the victorious classes, it may remain in the Walker Memorial Building, a memorial dear to you and your children and your children’s children.

We have no great athletic victories over other colleges to celebrate to-night. We had hopes of a victory over Harvard in the cross-country race; but the Harvard men were, unfortunately, too fast. And yet I am disposed to feel that we celebrate in one sense, to-night, a victory more important than any we are likely to achieve in the field of intercollegiate sport. This gathering is in honor of those who took part in our class contest of November

19; and this class contest represented a great departure from former events. It meant the substitution of an orderly and fair contest between the two classes in the place of the cane rush of other days. It represented even more than this; namely, the conclusion that for students in professional study the prolonged football and baseball campaigns which mark the present college contests are not possible to those who are dealing with the serious problem of professional study, and that it is wiser to make our participation in such contests a class affair rather than an intercollegiate affair, and to take part only in such intercollegiate sports as track athletics and similar contests, where the individual work of a contestant would count. In taking this attitude, I am sure you have made a distinct advance, and that your decision is one which will in the end bring you most credit and most enjoyment. I trust that the policy which you have this year inaugurated in athletics may be permanent, and it is scarcely necessary for me to say I am here to help in any way I can to such solution of college questions.

Two matters have come to my attention in connection with athletic contests of the past season, concerning which I am going to say a word of a somewhat personal sort. The first circumstance is a newspaper account in which it is stated that a considerable body of Technology students organized to cheer Yale at the recent contest with Harvard. Very likely this was a mistake. I have found myself that newspapers do, now and then, make mistakes. However, it furnishes an occasion for me to say a few words concerning our relations in athletic contests to our neighbor, the great university across the Charles. The relations of the Institute of Technology and of its students and teachers are equally friendly to all institutions of learning, but we have with Harvard ties which connect us with no other university. One of these is that of locality. We have the same home, and the world does not enjoy the sight of one neighbor's pleasure at another neighbor's defeat. There is another tie which you have perhaps not thought of: not only are many of our students from Harvard, but the men who sustain the Institute of Technology, who help in its advancement, and who are concerned for its future are in many instances the same men who minister to Harvard. I am trying at this moment to raise \$100,000 for the completion of the Walker Memorial Building, the erection of which will mean so much to you. Among those who have been most ready to assist are the men who are most active in Harvard. Do not think that I overvalue the meaning of this sort of student demonstration. I know perfectly well that there is no student and no teacher in the Institute of Technology who does not take pride in the glory of our neighbor, the oldest and greatest of American universi-

ties. Nevertheless, such small matters as that to which I have alluded are just those acts of courtesy whose observance helps to mutual respect and whose neglect works against it. Harvard and the Institute of Technology are not simply two schools related by being in the same yard. They are great national institutions, fostered by the same community, growing from the same soil, and sustained by the same public spirit. In one respect alone should they always be rivals; namely, in such acts as look toward the cultivation of common courtesy and mutual respect. You remember the story of the hunter in a Western State who found himself face to face with a giant grizzly, and who offered a prayer after this sort. "O Lord," said he, "help me agin this bear; but, if so be you can't help me, don't help the bear, and you will see one of the finest fights ever put up in this neck of woods." My feeling is that our attitude in athletics should be somewhat of the same sort. In football and baseball we are not to be competitors with Harvard. In track athletics let us beat her if we can; and, if we can't, let us "put up a good stiff fight." But, when Harvard joins battle with an outsider, let us cheer her on to victory. And, if you don't cheer for her, don't cheer for her opponent. Stand by and see a good fight, remembering that courtesy, like charity, begins at home.

I am afraid you will consider what I am to say next as somewhat in the nature of a preachment. If I were going to call it a sermon, I should take my text from the eighth chapter of Mark and the twelfth verse, which reads, "Why doth this generation seek after a sign?" I do not know what relation there was between the Sophomore-Freshman contest of November 19 and the disappearance of sundry shop signs from Huntington Avenue. I only know that the two events were closely related in the matter of time. Now I am not so hopeful as to imagine that anything I can say will take away the rage for souvenirs which prompts some students to remove signs from shops, and match-boxes and similar articles from hotels where they happen to be guests; but there is one feature of such transactions to which I wish to call your attention, and which struck me most forcibly when it was suggested by a chance conversation between two workingmen which I overheard in a street-car. They were discussing some exploit of this kind on the part of students. One said to the other in a tone which I could not help overhearing: "If my son or your son stole things to put in his room, the police would raid his room and arrest him. The laws are wrong. They protect these young aristocrats in their mischief, and they put in jail a young working-boy who steals a cigarette. I am against the whole government." It was not so much what was said as the intensity of expression which made

the speech significant. I doubt whether Technology students are in the habit of thinking of themselves as aristocrats. I am under the impression that I have heard you apply this term occasionally to others. Let me say to you that the man who disregards the law strikes a blow at the very force which makes civilization possible. No one thing so quickly develops the spirit of anarchy and discontent and of disunion as the belief that a privileged class exists in the State which is not responsible to the law. You cannot override the law in small or in great things without starting influences whose effects are more far-reaching than any man can foresee. Now there is one service which the educated man can render to the State which is above all other service, and that is the example of one who respects the law. If we cannot count upon the educated men for this service, their education seems scarcely worth the while. Perhaps you will think that I am speaking too seriously of a trivial matter. Let me say that I am not giving advice. I am only stating facts; and the incident I have mentioned is only one indication of how far-reaching and how injurious a trivial and a careless act may be, when that act involves a violation of that law which is intended to apply equally to all men, and which is considered a yoke of servitude when it bears unequally on different classes of men. I am seeking, and other men are seeking, to bring about for those who are students in this great city of culture a larger liberty of student life, to give you more and more the status of men rather than of boys, to make possible a modest and wholesome social life, to make more direct and more convenient the avenues which connect the student with those things which minister to the artistic, to the intellectual, and to the spiritual side of our natures. No man strikes so hard a blow at this effort as the student who, having entered into the liberty of a man, proves unworthy of that liberty. There is no discouragement so great or so difficult to bear as that which comes from the failure to respond to the opportunities of this larger liberty, whether that failure to so respond be indicated by one act or by another.

FALL HANDICAP TRACK GAMES

The annual fall handicap games were held October 19 on Soldiers' Field. The Freshmen furnished a surprise by winning the meet by a handsome margin. This is the first instance for many years in which the Freshman Class has won. The summary:—

ONE HUNDRED YARD DASH.—First heat won by E. B. SNOW,

Jr., '05 (4 yds.); second, L. F. Goldthwaite, '05 (4 yds.). Time, 10 2-5 s. Second heat won by C. R. Haynes, '04 (4 yds.); second, H. T. Winchester, '03 (scratch). Time, 10 1-5 s. Final heat won by C. R. Haynes, '04; second, E. B. Snow, Jr., '05; third, H. T. Winchester, '03. Time, 10 1-5 s.

TWO HUNDRED AND TWENTY YARD DASH.—Won by C. R. Haynes, '04 (8 yds.); second, E. B. Snow, Jr., '05 (6 yds.); third, W. B. Boggs, '04 (scratch). Time, 24 s.

FOUR HUNDRED AND FORTY YARD DASH.—Won by E. J. Hurley, '04 (5 yds.); second, H. H. Needham, '04 (5 yds.); third, W. A. Clark, '05 (scratch). Time, 1 m.

HALF-MILE RUN.—Won by R. P. Nichols, '05 (20 yds.); second, H. B. Pulsifer, '03 (35 yds.); third, F. O. Sprague, '05 (23 yds.). Time, 2 m. 18 s.

ONE MILE RUN.—Won by R. P. Nichols, '05 (40 yds.); second, F. O. Sprague, '05 (35 yds.); third, A. C. Dickerman, '05 (40 yds.). Time, 5 m. 13 4-5 s.

TWO MILE RUN.—Won by F. B. Riley, '05 (100 yds.); second, A. J. Sweet, '04 (scratch); third, H. F. Peaslee, '03 (scratch). Time, 11 m. 31 2-5 s.

ONE HUNDRED AND FIVE YARD HIGH HURDLES.—Won by R. L. Kruse, '03 (6 yds.); second, R. D. Emerson, '05 (6 yds.); third, K. C. Grant, '02 (scratch). Time, 15 2-5 s.

TWO HUNDRED AND TWENTY YARD LOW HURDLES.—Won by L. U. Fuller, '05 (6 yds.); second, G. A. Curtis, '04 (6 yds.); third, K. C. Grant, '02 (scratch). Time, 28 2-5 s.

RUNNING BROAD JUMP.—Won by L. U. Fuller, '05 (6 in.)—distance, 19 ft. 2 in.; second, K. C. Grant, '02 (scratch),—distance, 18 ft. 5 in.; third, L. C. Hammond, '02 (1 ft.),—distance, 19 ft. 1-2 in.

RUNNING HIGH JUMP.—Won by R. D. Emerson, '05 (3 in.),—height, 5 ft. 5 in.; second, G. A. Curtis, '04 (1 in.),—height, 5 ft. 6 in.; third, H. E. Berry, '05 (scratch),—height, 5 ft. 6 in.

POLE VAULT.—Won by G. A. Curtis, '04 (scratch),—height, 10 ft. 1 in.; second, H. E. Berry, '05 (8 in.),—height, 10 ft. 1-2 in.; third, M. Mackie, '05 (1 ft.),—height, 10 ft. 1-2 in.

The summary of points by classes:—

<i>Events.</i>	1902.	1903.	1904.	1905.
One hundred yard dash	—	1	5	3
Two hundred and twenty yard dash	—	—	6	3
Four hundred and forty yard dash	—	—	8	1
Half-mile run	—	3	—	6
Mile run	—	—	—	9
Two mile run	—	1	3	5
One hundred and twenty yard high hurdles	1	5	—	3
Two hundred and twenty yard low hurdles	1	—	3	5
High jump	—	—	3	6
Broad jump	4	—	—	5
Pole vault	—	—	5	4
Totals	—	—	—	—
	6	10	33	50

WINTER MEET

The indoor games were held at the Gymnasium on December 19. The summary was as follows:—

FINAL HEAT, THIRTY-FIVE YARD DASH.—Fuller, '05, first; Crowell and Boggs, '04, tied for second. Time, 5.01.

FINAL HEAT, FORTY YARD HURDLE.—Barry, '04, first; Fuller, '05, second; Kruse, '03, third. Time, 5.01.

POLE VAULT.—Curtis, '04, first; Dewis, '04, second; Spaulding, '03, third. Height, 9 ft. 14 in.

HIGH JUMP.—Curtis, '04, first; Winchester, '03, and Pember, '02, tied for second. Height, 5 ft. 6½ in.

BROAD JUMP.—Sawyer, '02, first; Homer, '04, second; Winchester, '03, third. Distance, 6 ft. 8 3-4 in.

SHOT PUT.—Winchester, '03, first; Morrill, '04, second; Brown, '02, third. Distance, 37 ft. 3½ in.

FENCE VAULT.—Schlemm, '03, and Baker, '04, tied; Clark, '04, third. Height, 9 ft. 5 $\frac{1}{4}$ in.

An amusing potato race accounted for the remaining points, and was won by Clark, '04.

CROSS COUNTRY TEAM RACE

The cross country Team Race between Harvard and M. I. T. took place December 14. Summary:—

Position.	Name.	Elapsed Time.	Score.	
			H.	M. I. T.
1	E. W. Mills	30 m. 16 s.	1	—
2	H. F. Peaslee	30 m. 48 s.	—	2
3	W. W. Hallagher	31 m. 03 s.	3	—
4	F. B. Riley	—	—	4
5	J. H. Hall	—	5	—
6	W. A. Pownall	—	6	—
7	J. D. Clark	—	7	—
8	I. T. Worcester	—	—	8
9	F. J. Fraser	—	—	9
10	C. M. Hardenbergh	—	—	10
			22	33

Distance, 5 $\frac{1}{2}$ miles.

The Officials: Judges, Professors Pope, Burton, and Parks, T. Timers: Willis and Sargent, H.; Morse, T. Starter: Winchester, T.

TECH FLAG

In November the students chose by ballot a Tech flag from a number of designs submitted. The flag is pennant-shaped, of cardinal red, with a triangle in gray containing a red T.

THE INSTITUTE COMMITTEE

The Institute Committee for the present school year is as follows: Harold Y. Curry, president, H. K. Hooker, and R. A. Pope, '02; L. H. Lee, president, P. R. Parker, L. H. Underwood, '03; L. P. Burnham, president, M. L. Emerson, Guy Hill, '04;

together with the president and two members of the class of '05. The '02 sub-committee to the Institute Committee has been formed, and consists of I. Rayne Adams (chairman), Farley Gannett, E. H. Cutter, B. E. McKechnie, R. V. Brown, H. K. Hooker, S. A. Gardner, Jr., R. S. Williams, E. LeR. Brainerd, and R. A. Pope.

CLASS ELECTION

The results of the Senior Class elections, which closed October 21, are as follows: president, H. Y. Curry; first vice-president, R. V. Brown; second vice-president, K. Lockett; secretary, F. H. Hunter; treasurer, C. R. Place; Executive Committee, S. A. Gardner, E. T. Pollard; Institute Committee, H. K. Hooker, R. A. Pope.

The following officers were elected by the class of 1903 to serve during the Junior year: president, L. H. Lee; first vice-president, H. Crosby; second vice-president, L. W. Adams; secretary, C. P. Nibecker; treasurer, tie between R. B. Williams and J. F. Doran; board of directors, T. G. Babcock, H. S. Baker; Institute Committee, P. R. Parker, L. H. Underwood.

The officers of the class of 1904 have been elected for the following year, and are as follows: president, L. P. Burnham; first vice-president, M. E. Mason; second vice-president, C. F. Hunter; secretary, A. C. Downes; treasurer, tie between C. Lang and H. W. Goddard; board of directors, D. B. Barry; Institute Committee, M. L. Emerson and Guy Hill.

The ballot of the class of 1905 resulted as follows: president, Norman Lombard; first vice-president, A. J. Amberg; second vice-president, Mitchell Mackie; secretary, Robert N. Turner; treasurer, Theodore Green; board of directors, Ralph M. Whitcomb and Edgar L. Hill.

CLUBS AND SOCIETIES

The Civil Engineering Society held its first meeting of the year on October 28. President Pritchett spoke on the subject of "Some Extraordinary Variations of the Magnetic Needle observed in

Alaska." About one hundred and fifty students were present at the talk. It is the purpose of the society to hold special monthly meetings at which well-known civil engineers are to speak. Through the courtesy of the Technology Club these meetings will be held in the lecture-room of the club. Instead of the one formal dinner of the society which has previously been in vogue, there are to be two or three informal dinners scattered along through the winter.

The first regular smoke talk of the *Civil Engineering Society* was held November 21 at the Technology Club-house. According to President Pritchett's wishes, it was a perfectly informal affair, and refreshments were served. A very large number of students were present, who thoroughly enjoyed the evening, and listened to some very entertaining and instructive words from Mr. Breed and Mr. Flannery on the "Relations of the Contractor and Engineer."

The *Naval Architectural Society* opened its third year by a banquet at the Technology Club on Tuesday evening, November 12. The guests of the evening were President Pritchett, President T. M. Watson, of the Fore River Ship and Engine Company, Professor Cecil H. Peabody, Mr. Walter McConnell, '98, chief draughtsman of the Fore River Ship and Engine Company, Mr. Walter S. Leland, and Mr. William S. Newell.

A meeting of the *Mechanical Engineering Society* was held on Thursday, December 12, for the purpose of choosing officers. The following men were chosen: president, F. A. Robbins; vice-president, Paul Weeks; treasurer, W. H. Adams; secretary, W. S. Fitch; Executive Committee, C. D. Starr, L. W. Adams, R. L. Frost; Programme Committee, Professor Merrill, Professor Miller, Matt Brodie, Paul Weeks, W. S. Fitch, T. F. Doran, R. R. Jordan.

The officers of the association of *Musical Clubs* are as follows: president, Henry W. Hudson, '02; vice-president, Francis J. Field, '02; secretary, Walter Wellman, '02; manager, Kenneth Lockett, '02.

The individual clubs are gaining the necessary perfection under the leadership of the following men:—

For the Glee Club: leader, Claude E. Patch, '02; manager, Lewis G. Wilson, '03.

Banjo Club: leader, Donald M. Belcher, '02; manager, Stuart W. Benson, '04.

Mandolin Club: leader, Francis J. Field, '02; manager, John R. Morse, '03.

There are still vacancies in all the clubs, and everybody having an ear for music is earnestly requested to try for them.

The annual concert was given December 18 in Huntington Hall, Rogers Building. The hall was well filled with an audience consisting almost wholly of Tech men and their friends. There were twelve numbers on the programme, comprising selections by the Glee, Banjo, and Mandolin Clubs separately, and a solo by Mr. Fred L. Higgins, '03.

After the concert a reception was given the members of the clubs and their friends at the Technology Club. Refreshments were served, and a very pleasant half-hour in the spacious rooms of the club-house closed the entertainment for the evening.

The *Freshman Debating Club* is ready to begin work in earnest; and on Friday, December 13, a meeting was held, at which the following officers were elected to serve for the first term: president, J. P. Barnes; vice-president, Herman Eisele; secretary, E. C. Weaver; treasurer, J. Daniels; member of the Executive Committee, F. S. Elliott.

CADET DANCE

The corps of cadets opened its social season December 20 with a dance in Paul Revere Hall, Mechanics' Building. The matrons were Mrs. Henry S. Pritchett, Mrs. Davis R. Dewey, Mrs. Henry P. Talbot, and Mrs. Dana P. Bartlett.

EXCURSION OF NAVAL ARCHITECTS

Under the direction of Professor Peabody the fourth-year class in naval architecture started from Boston Saturday, November 16, for an excursion to visit ship-yards, on the steamship "Howard" of the

Merchants' and Miners' Line. By permission of the company a speed and power test was made on the way from Boston to Norfolk, Va., powers being obtained by indicating the engine in the usual way, and speeds being obtained by an electric log, which was checked by taking distances along shore from Bay Head to Barnegat light-ship. The following places were visited: the Newport News Ship-building and Dry Dock Company at Newport News; Maryland Steel Company's yard at Sparrow's Point; the Navy Yard at Washington, to see the model towing basin; the New York Ship-building Company at Camden, N. J.; and the William Cramp Ship and Engine Building Company at Philadelphia.

THE GRADUATES

M. I. T. ALUMNI ASSOCIATION

The annual meeting and dinner of the Alumni Association of the Massachusetts Institute of Technology was held December 27 at the Brunswick, with about 150 members and guests in attendance. Charles T. Main, the retiring president, acted as toastmaster; and addresses were made by Hon. Charles S. Hamlin, Hon. Herbert Parker, attorney-general-elect, and James P. Munroe, president of the Technology Club. President Pritchett, who was expected as the principal speaker, was absent in the country, taking a much-needed rest, and was therefore not able to attend. He sent his regrets. Before the dinner there was a business meeting, at which the following committees reported: Nominating Committee, Alumni Committee on School, Committee on William B. Rogers Scholarship Fund, Trustees of Alumni Fund, Advisory Council on Athletics, Committee on Affiliation of Branch Associations with the Parent Association, Walker Memorial Gymnasium Committee.

The Walker Memorial report appears on page 98, and other reports will appear in the April number. The following officers

were elected : president, A. Lawrence Rotch, '84 ; vice-presidents : one year, Frederic H. Fay, '93 ; two years, John Alden, '77 ; secretary, Arthur G. Robbins, '86 ; Executive Committee : two years, Franklin W. Hobbs, '89, and Frank L. Locke, '86 ; one year, Louis A. Ferguson, '88 ; Alumni Committee on School, Giles Taintor, '87 ; member of Advisory Council on Athletics, Thomas Hibbard, '75 ; Committee on Associate Membership, Richard A. Hale, '77, Walter B. Snow, '82, Winslow Blanchard, '88.

In his opening remarks President Main called attention to the gratifying fact that \$100,000 has been raised in the last year by members of the Alumni Association for the Walker Memorial Fund. He said the Association is constantly increasing in strength and efficiency, and pointed to the number of its members who are holding responsible positions. After reading a brief letter of regret from Judge Edgar J. Sherman, who was expected to speak, in which he said, "I am a believer in the Institute," Mr. Main introduced Attorney-general-elect Parker, who said in part : —

The field to which your lives are devoted is broad enough to satisfy the ambitions and wide enough to pass beyond the imagination of any man. To what body of men do our citizens look in gratitude for the great industrial and commercial progress which our nation has attained ? It is to the graduates of this great Institute which you love, which the Commonwealth loves and fosters. Wherever you find American progress and American interests in the ascendancy, there you shall find that the men from the Institute of Technology have been in the front rank of the leaders in this progress.

In the field of architecture you are prominent, and it is a gracious service you perform. And what shall I say of your engineers ? There is no rocky mountain inaccessible to your achievements. And so it is through all the departments of scientific endeavor.

And now I wish to say a word, as a lawyer, about the scientific expert. You have all heard him discussed and criticised. The expert, as I have known him, is a man winning and deserving the respect of all who listen to him. It is a sacred trust that he undertakes. And the type, as I have known him, is an honor to his fellow-men, to the science which he represents, to the institution which gave him training ; and I am sure your President will pardon me if I refer to him, from personal experience, as an illustration of what I mean.

Charles S. Hamlin spoke on the effect of the recent insular decisions of the United States Supreme Court upon our colonial problems. According to these decisions, as he defined them, Porto Rico and the Philippines, as soon as the treaty of peace with Spain was signed, had ceased to be foreign countries; and, therefore, under the Constitution of the United States their imports could not be taxed unless by a special act of Congress. Some of the judges held that, being a part of the United States, Congress had no power to impose a tax on their imports; but Justice Brown, who had the deciding vote, held that something more than mere annexation is necessary before these colonies are actually incorporated into the United States, and that, therefore, they are in a sense foreign territory.

Mr. Hamlin argued that there was nothing in the cases decided that warrants anything more than the proposition that the United States can hold colonies temporarily. Justice Brown, he said, decided that Congress, as a temporary measure only, can levy a tax on outlying territory after it has been annexed, although it remains for Congress to determine when the temporary necessity of such a tax has ceased. The Porto Rican duty is, therefore, only temporary.

“The question now,” continued Mr. Hamlin, “is what are we to do with the colonies which we have? If we maintain the open door, we give up all commercial advantage which we hope to derive from the possession of the Philippines. If we cannot compete with England here in Boston, how can we expect to compete with her 7,000 miles away, if the tax is the same on all our goods?”

“On the other hand, if we are to give the Philippines ultimate statehood, and our holding of them is to be simply in their own interest, I see no reason why we should give them any greater privileges than we accord to the rest of the world. But, if it is our intention to hold them permanently as our property, I see no reason why we should not have absolute freedom of trade with them or any other part of the great American empire. The restoration of the Dingley tariff to imports from the Philippines means absolute industrial ruin to them, as well as to Porto Rico and Cuba.”

Mr. Hamlin recommended the strict application of civil service principles in making appointments to the colonies, and said he believed, under President Roosevelt, that would be done.

Mr. Munroe paid a high compliment to President Pritchett, saying that he had met every requirement of the Institute and in no direction had failed. There are two or three serious problems facing President Pritchett and the Institute. There is, first, the problem of providing room and facilities, and, second, the problem of finding money. But the greatest problem of all is that of reaching the individual student and giving him the personal attention that will send him forth a man as well as an engineer.

“In too many of the large colleges,” continued the speaker, “the young man is virtually told: ‘This is no place to get real education. It is the place to get the finest instruction in the world; but, as for those things which make for character and for good citizenship,—things that were and still are taught in the small colleges,—this is no place to get that sort of education.’ The college is no longer an intellectual family. It is an intellectual army, and the fellow who cannot keep step simply drops out. If this is to be the outcome of universal education, then truly are we selling our birthright for a mess of pottage. This is a problem which every college president has to solve, and it is one which President Pritchett is considering in everything he does for the welfare of the institution.”

NORTH-WESTERN ASSOCIATION OF THE M. I. T.

From the *Tech Bulletin*, published monthly by the North-western Association of the M. I. T., it is learned that at the November meeting of the Association Dr. Frank described his experiences in Siberia, Corea, Japan, and China, and Mr. Cy DeVry gave an amusing talk on Animals. The December meeting was held at the Union, 111 Randolph Street, and was addressed by Judge Baker, Mr. P. W. Leffler, who described his electro-magnetic railway, and Mr. John McCutcheon, who related his experiences in the Philippines. The annual banquet of the Association will be held about the first of March.

THE WASHINGTON SOCIETY OF THE M. I. T.

The Washington Society of the Massachusetts Institute of Technology held its annual business meeting and banquet on the evening of Saturday, December 7, 1901, in the banquet hall of “The

Cairo," twenty-one members being present. The guest of the evening was Assistant Surgeon J. Herbert Ford, U.S.A., recently returned from the Philippine Islands, who at the close of the business meeting entertained the society with a talk on conditions in the Philippines. Mr. G. H. Matthes, '95, followed with a brief account of the expedition sent by the Institute to observe the total eclipse at Padang, Sumatra.

The annual election of officers resulted as follows: H. A. Pressey, '96, president; P. L. Dougherty, '97, vice-president; Winthrop Cole, '87, secretary; Frank O. Stetson, '88, treasurer; William J. Rich, '84, member of Executive Committee.

Perhaps the most important feature of the business transacted at this meeting was the adoption by the society of the report of the provisional committee on "Information for Institute Men relative to Scientific Service under the United States Government." The resolutions embodied in this report express the intention of the society to conduct the publishing of a series of articles in the TECHNOLOGY REVIEW descriptive of the various branches of work carried on by the scientific bureaus of the government. This work will be intrusted to a "Committee on Publication," consisting of five members, representing the more important branches of the department service, who shall act with the advice and co-operation of the President and Faculty of the Institute. The object of this important and unprecedented step is, in brief, to give the Institute and its alumni the benefit of the experience of those who are acquainted with the nature, requirements, and advantages of government work.

THE TECHNOLOGY CLUB OF CINCINNATI

"It may interest some of our readers to learn something of the recent visit of President Pritchett to Cincinnati. We had been looking forward to meeting our new President for some months past, as it was expected that he would be with us last spring; but he was detained on account of illness.

"A very pleasant evening was spent at the Queen City Club, Friday, December 20, by the alumni and former students of the Massachusetts Institute of Technology residing in Cincinnati and

vicinity. An informal dinner was given to Dr. H. S. Pritchett, the new President of the Institute, who came to Cincinnati as the guest of the Commercial Club. Very few of the Tech men had ever met the new President; and there was a fairly good attendance, although a large number were unavoidably absent.

"There has been no organization of Technology men in Cincinnati and vicinity, and only one previous meeting in the recollection of the writer, and that on the occasion of a similar visit of President Walker, some eight or ten years since.

"Those of us who had worked under General Walker, and had known him more or less intimately, felt his loss keenly, and had been in doubt of the ability of the Corporation to fill his place. It was extremely gratifying, therefore, to have this opportunity of meeting President Pritchett; and we all went home with the feeling that the students at the Institute were to be congratulated on having a man in charge of affairs who not only possessed the dignity and executive ability necessary to the position as President of such an institution as the Institute, but who is also a personal friend, warmly interested in the welfare of every student.

"Mr. George W. Kittredge presided, and was very happy in his introduction of the President and of the representatives of the various classes. President Pritchett gave a very interesting account of the work that has been accomplished and projected since he has become head of the Institute; and, as we listened to his story of the wonderful progress that has been made in the last few years, and other plans about to become realities, we almost wished we were again students at dear old Tech, and were certainly prouder than ever to look back upon her as our Alma Mater.

"Major Bixby, as the senior student present, gave a very interesting account of his early experiences and his subsequent training as an engineer in the various institutions in this country and abroad. He was followed by Mr. J. S. Neave, Charles G. Merrell, A. O. Elzner, and William B. Poland. It was decided to form a permanent organization; and Messrs. Neave, Stanwood, Elzner, Kittredge, Proctor, and Merrell were appointed a Committee on Organization.

"There were present at this dinner to meet Dr. Pritchett, W. H.

Bixby, '70, William E. Brotherton, '73, John A. Hildabolt, '75, George W. Kittredge, '77, Daniel C. Hemingray, '79, J. S. Neave, '86, J. C. Hobart, '87, A. O. Elzner, '87, Charles G. Merrell, '88, William B. Poland, '90, W. E. Hopton, '91, J. W. Ellms, '93, R. W. Proctor, '94, W. M. Andrews, '96, Stanley A. Hooker, '97, Walter L. Rapp, '00, J. L. Parke, '01, J. T. Lippincott, '01, J. B. Laws, '01, Benjamin Miller, '01, W. F. Helmick, '03.

"The visit of the President to Cincinnati has revived interest in Technology affairs; and one result of the informal dinner on Friday night was the formation of a Technology Club for Cincinnati and vicinity, which was regularly organized on Friday, the 27th, one week after the dinner. There will probably be two meetings a year,—a midsummer outing and a midwinter dinner,—at which we shall hope to have the President as our guest.

"The following officers were elected:—

"J. S. Neave, president; James B. Stanwood, vice-president; George W. Kittredge, treasurer; Charles G. Merrell, secretary; Executive Committee: A. O. Elzner, R. W. Proctor, W. E. Hopton."

CHARLES G. MERRELL.

WALKER MEMORIAL

The following report was presented at the recent meeting of the Alumni Association:—

"Your committee presents its third annual report with the greatest possible satisfaction. One year ago we reported 553 subscriptions, amounting to \$40,879.10. We reported, also, the assurance by the Corporation of land and maintenance, provided our subscription should be completed by July 1. We all hoped for success. Not one of us was sanguine that it could be achieved by that time. Inspired and aided by President Pritchett's co-operation wherever and whenever inspiration and aid were most needful, we redoubled our efforts through class associations, local organizations, and individual Institute men in less accessible districts. Nothing is so effective in securing subscriptions as good example. The good example set by the men who had contributed began to bear good fruit. The visits of President Pritchett to local socie-

ties in other parts of the country, and in particular the great banquet of the North-western Society, were especially productive.

"Late in May we had brought our fund up to nearly \$90,000; and we determined, if possible, that the total should be reached not merely by July 1, but by graduation day. A heavy broadside of telegrams and urgent messages brought us on the morning of June 4 only to \$93,000, and we ceased to hope for immediate success. We had not reckoned on the class of 1901, however, which had postponed its share of the undergraduate effort. The class of 1901 held its final meeting at eleven o'clock, and with splendid enthusiasm subscribed at once more than \$5,000. The end was now too near to be missed, and a few effective messages made it possible for the President to announce the completion of the subscription at the graduation exercises.

"Since that time your committee has rested from its labors. On the present situation we are able to report as follows:—

"The alumni subscription to date amounts to \$100,796.26 from 1,806 persons. Of this amount approximately \$50,000 has been paid in, and \$45,000 transferred to the Treasurer of the Institute in accordance with your instructions of last year.

"By agreement with your committee a special committee of the Corporation has been appointed to solicit subscriptions toward a second hundred thousand dollars from outside sources. The President and Corporation recognize that the erection and equipment of the Memorial Building ought to involve an outlay of not less than \$200,000, and the \$100,000 which we have secured is the most effective argument for contributions toward the second. Already \$25,000 has been pledged on this supplementary subscription.

"The provisional plans presented last year have been further studied by the department of Architecture, with good results, which we hope to communicate to our contributors in due season. It is our hope that further progress of the subscription and the completion of the architectural plans will make it possible to lay the foundations in the spring, and to complete the Memorial within the year.

"Your committee would be glad to consider its duties of solicitation at an end with the completion of the \$100,000 originally

sought. On the other hand, the Corporation is involved in such very large and urgent expenses that our further aid is earnestly desired by President Pritchett. We have recognized from the outset that \$100,000 would be inadequate, and have looked forward to the necessity of supplementing the alumni subscription by aid from other persons,—aid which we deemed specially appropriate in view of the generosity with which President Walker gave himself to innumerable forms of public and friendly services, and the fact that ours is the only Memorial in which general participation has been possible. We are asked, therefore, by the President and Corporation to assist in bringing the character and needs of the Walker Memorial to the knowledge of persons likely to be able and willing to contribute to it on the basis of personal regard for President Walker or interest in student welfare. Within these limits we hope for the co-operation of Institute men generally, asking them either to present the matter directly on the basis of personal acquaintance or to communicate names to us for correspondence. In the second place, we venture to hope that some of the many former students who have not yet responded may be glad to help while there is yet time. We therefore offer the following motion: That the Walker Memorial Committee be authorized to take such steps as it may deem proper to secure further subscriptions from persons who may be specially interested in the proposed Memorial to President Walker, and to receive any further subscriptions from Institute men who have not already contributed."

TREASURER'S REPORT

Balance, Dec. 29, 1901	\$15,564.01
Subscription payments, 1901	34,250.68
Alumni Association appropriation	300.00
Interest	324.10
	<hr/>
	\$50,438.79

1901.

Paid George Wigglesworth, Treasurer	\$45,000.00
Bills paid	1,009.81
Exchange on checks	23.72
Balance	4,405.26
	<hr/>
	\$50,438.79

CHAS. M. BAKER, *Treasurer*,

THE TECHNOLOGY CLUB

Since the last issue of the REVIEW the Club "season" has been successfully continued. On the second evening, Miss Katherine Jewell Everts gave a dramatic presentation of "Jocelyn Leigh," arranged from Miss Johnston's novel "To Have and to Hold." Ladies were invited to this evening, and a large company enjoyed the clever adaptation and finished acting of the story. On Saturday evening, October 26, in order that the college graduates attending the Institute might meet President Pritchett and members of the Faculty, the club-house was opened to them from eight to ten p.m.; and, while the attendance was not so great as was hoped, the representation of colleges was large, and the evening was a success. On Thursday, November 14, the eminent astronomer and brilliant lecturer, Sir Robert Stawell Ball, gave an illustrated talk on the Astronomical Theory of the Ice Age. Professor Ball paid a high tribute to the Institute before introducing his subject. His genial personality pleased the club members exceedingly. The fourth evening was held on November 19, when Captain John Bordman, Jr., recently of the volunteer army in the Philippines, and a former military instructor at the Institute, gave a "smoke talk" on the Philippines. Captain Bordman related his experiences well, and his enthusiastic account of the possibilities of the islands was most interesting. Another ladies' night was given on November 26, when Mrs. Mabel Loomis Todd gave a brilliant talk, illustrated by many interesting lantern slides, on a "Trip to Tripoli." The demand for tickets for this evening was exceptionally large, and the Common Room was crowded. Mrs. Todd delighted her audience this year, as at her "talk" of season before last. On Friday, December 12, Dr. Ira Remsen, president of the Johns Hopkins University, gave informal and most delightful reminiscences of Professors Sylvester and Roland. He was the guest of the club during his stay in Boston. On the seventh evening, Dr. Booker T. Washington, principal of the Tuskegee Institute, spoke on "Hand-work in Education." His sincere devotion to his work was continually manifest in his talk, which was brilliant with well-told anecdotes. Afterwards he answered many questions asked him by members.

On December 16 the club, with a fund given for the purpose, tendered a dinner at the "Gym" on Exeter Street to the participants in the Tech Field Day. An account of it appears on page 82. On the 18th, after their annual concert, in Huntington Hall, the club received the members of the Musical Clubs and their friends. Mrs. Dana P. Bartlett and Mrs. Walter H. Kilham received.

It was with deep regret that on the evening of December 29, at the council meeting, the resignation of Mr. Walter E. Piper, '94, as treasurer of the club, was read, and had to be accepted. Mr. Piper has been with the club more than two years, as treasurer, and has been most devoted in his work. It was during his service that the club succeeded in having a balance on the right side of its books, and it was also during his time that the arduous work of buying and refitting the new club-house was performed. At the same meeting Mr. Andrew D. Fuller, '95, was elected treasurer of the club to serve in place of Mr. Piper. The club considers itself fortunate in securing the services of Mr. Fuller.

As has already been announced, the upper two stories of the old club-house were retained by the club, and at present are fully occupied by members. Numerous applications for membership have been entertained, and the club list has been materially increased.

Interesting announcements of future club evenings have been made on the regular notices sent to members.

ANNOUNCEMENT

It may be of interest to readers of the REVIEW to be reminded that the secretary of the Institute is glad to transmit appointment blanks to any Institute men who are desirous of change of work. At present the demand for men who can be recommended is materially in excess of the number available.

NEWS FROM THE CLASSES

1868.

ROBERT H. RICHARDS, *Sec.*, Mass. Inst. of Technology.

Bryant P. Tilden, of Bismarck, No. Dak., writes: "I have been acting as general superintendent and engineer for contractors engaged in construction of water-works and sewer systems at Fort Lincoln, a new military post that is being established a few miles south of this city of Bismarck. The water system, very complete, consists of four eight-inch Artesian wells, each about one hundred feet deep. They furnish six hundred gallons of water per minute to a Deane steam pump, which forces the water through about seventy-three hundred feet of six-inch main and some fourteen hundred feet of four-inch main. There is on the line a sixty-thousand gallon tank reservoir raised on trestles, there being no natural elevations on the ground, some nineteen fire hydrants, and other attachments. The sewer system is also about seventy-three hundred feet of ten-inch pipe and four thousand feet of laterals, with man-holes, lamp-holes, and flush-tanks, all of the most approved pattern and of most thorough construction in all details, as required by the War Department. They are very particular fellows, those military officers. Besides the above, I have during the summer planned a sewer system for the city of Mayville in this State, to be constructed next year. That's all I've done outside the regular work of the surveyor-general's office."—Charles E. Greene writes from Ann Arbor: "I spent a portion of the summer in making plans and specifications for intercepting sewers for the city of Jackson, Mich., to remedy the pollution of Grand River." A paper on the 800-feet-steel arched highway bridge at Niagara Falls, read before the Institute of Civil Engineers of Great Britain the past season, stated that the arch was worked out by the method developed in Greene's graphics.—From Long Branch, N.J., Whitney Conant writes: "I spent an idle summer abroad, not particu-

larly in search of health, because I am really better right here at home than I am anywhere else, now that I have learned what my requirements are, but just having a lazy good time. That may strike you as unworthy living, as you students and investigators think work should never cease; but, then, what is the use in my case, when there are so many better fitted and more able, though perhaps no more willing, to benefit humanity than I am?" The secretary replied, "I may have held views at one time that rest was waste of time, but I am well over that idea now."—Albert F. Hall, from 3 Cordis Street, Charlestown, writes: "After graduating in 1868, a friend and myself made a pedestrian trip to the White Mountains from Boston, my friend remaining there while I walked home alone. We walked through the Franconia Notch, visiting the Flume, and sat for our photographs on the top of the famous bowlder, washed away a few years ago by a great slide. From thence we went to Mt. Lafayette, where we slept half-way to the top that night. We then continued on our trip, and in one day walked from the Willey House over the four mountains to the top of Mt. Washington, and down the carriage road to the Glen House,—a pretty good day's tramp. Since then I have made many trips to these beautiful mountains, every one of which seems to bring forth new wonders; and one is never tired of the magnificent scenery. After four years without rest I was compelled last summer again to seek my favorite resort, making nearly the same trip that was made in 1868, but this time by rail and stage. At the time of the first visit there were no railroad communications, and the journey was then generally made by stage. The Mt. Washington Railroad was then just started. Many curious experiences occurred during our pleasant walk, never to be forgotten. In talking with an old farmer in the Pemigewassett Valley, he told us that he thought that six cents was not too high for the trouble of making up a bed and giving a room for one night. I am inclined to think his ideas would be somewhat enlarged at this time. At the foot of the new Mt. Washington road we found nice lodgings, costing us twenty-five cents each, including a most excellent supper and breakfast, well cooked and well served. Our meals gen-

erally consisted of bread and milk eaten in the fields. How different was the trip of last summer! Going to North Woodstock, I remained one week at a modern but modest boarding-house. Unfortunately, it rained nearly every day of my stay, so that I was unable to enjoy my hobby of photography. But some excellent views were obtained of the Notch from Ferncliff, the summer home of Mr. Carpenter, one of the masters of the Boston High School. During this visit our President died, and flags were at half-mast, making things rather gloomy. One night some miscreants tore down half of a large and beautiful flag, leaving the pieces in the road. The next day the 'camera fiends' were at work, and the writer secured a most excellent picture of our noble but disfigured flag. I climbed Loon Mountain alone, took some unsatisfactory pictures, and tried in many ways to drive away dull care, finally leaving lovely North Woodstock by stage for the far-famed Profile House, celebrated for its surroundings and its fine cuisine. Memorial services were held in the Grand Hall for the late President, and all business on the railroads and at the telegraph stations was stopped for a short period. The 'Old Man of the Mountain' was visited, and of course had to be 'taken in' by the ever-ready camera. The camera used this year was borrowed, and had one of the famous Goerz lenses, the finest in the world. Its powers are marvellous, even small pictures, $3\frac{1}{4}$ inches by $5\frac{1}{4}$ inches, when enlarged to 10 inches by 12 inches, giving such sharp detail that they would be taken for originals. I have also another Goerz lens for a larger camera, and the delight one has in using such lenses can hardly be expressed by words. The pictures tell their own tale. After climbing some of the lesser mountains about the Profile House, the trip was continued by rail to the beautiful place of Bethlehem, the favorite resort of Starr King. What a change! In 1868 there was the old Lincoln House and a few others standing; but now, like the surroundings at the Profile House, many new and beautiful hotels and cottages have sprung up. The air and weather at Bethlehem is far-famed; and the short stay, even if it did rain, was very enjoyable. Mt. Agassiz was climbed and enjoyed, and later some fine views were obtained of the Presidential Range.

Our journey was then continued to the Mt. Pleasant House, where the mountains were seen and photographed in all their glory. Mt. Washington was covered with snow. Here the writer was fortunate enough to discover and photograph the most remarkable profile he ever saw. It is far superior to the famous 'Profile,' as the details of the face are marvellous; and all who have seen it are struck with its beauty. I have named it the 'Old Man of the Ammonoosuc.' Some say it strongly resembles Queen Victoria; but, as an old New Englander, I prefer the more patriotic name of our old historical river. The last part of my trip was through that glorious Crawford Notch, which I love so much, and where some fine pictures were obtained on the moving train,—a much more difficult feat than that required to photograph a moving object from a point of rest. But that Goerz lens is equal to anything, and I advise all lovers of the camera to get one. We now came to the lovely Jackson, the place of all others in the mountains. Jackson abounds in beautiful walks and fine mountain views, and for rest and the enjoyment of Nature in all her colors has no superior. I have visited here many times, and, after seeing other places, return to Jackson more contented than ever with its loveliness. The lover of the camera can find enough here for every moment of his time, and never take all he wants. The variety of the views is great, and the autumn foliage is beyond description. Could we only see the day when these colors can be caught in all their beauty by the camera! I hope to live to see this result accomplished. In writing of mountains, I am reminded of a pedestrian tour made in the Switzerland Alps in 1871, and recall a scene witnessed by the immortal Mendelssohn and described in his charming letter of August, 1831. It was some years after my trip that I read this; and it was remarkable that I should have happened to see the same view as the renowned musician in August, 1871, forty years later. It was on the Rhigi. I had just dined, and looked out to see what there was around, ascending the steps to the observation stand. Behold! All was in a dense cloud and nothing could be seen, when suddenly the clouds lifted, like the curtain on the stage in a transformation scene, and what a view! Cloud after cloud lifted,

and new scenes presented themselves. First the valley with its lake and beautiful verdure, then the mountains with their snow and extended glaciers. I wish all could see such a view: it was one of a thousand. In travelling about Switzerland, it is a pleasure to meet the peasants and listen to their quaint German. I am a great lover of mountains and country scenery, and have enjoyed trips among the Scottish lakes, lakes of Killarney, the mountains of North Wales, the famous canals of Sweden, two hundred feet between levels, hewn from the solid rocks, the beautiful fiords of Norway, the wonders of Bohemia, the beauties of the Danube, our own Hudson, Lakes George and Champlain, and the old Green Mountains of New England. It is in such places that one forgets the cares of life, and lives in another world. Nature is surely a grand study, and one tending to call forth our noblest thoughts. I trust this rambling letter will not be without some interest, and induce my friends to follow the paths I have taken, if they would enjoy things never to be forgotten, and leaving upon the memory some of the most beautiful experiences of life."—From 53 State Street, Boston, Joseph Stone writes: "Last summer from the first of July to October first we spent in the Adirondacks, on Lake Placid, where from its elevation of nearly 2,000 feet we were exceedingly comfortable, the thermometer rarely rising above 80 degrees, and one morning in August it was only 35 degrees. The remainder of the year I spend here, looking after my real estate, buying and selling a piece occasionally, requiring very little of the Calculus." The secretary writes, this announcement grieves him, as he was at Lake Placid in July, but failed to meet Joe.—Walter H. Sears writes from Plymouth: "Things go on very quietly down here, so far as I am concerned. I often think, when I come to Boston, that I ought to come down and make you a call, and talk over old times once more. I may venture to intrude some time on your professional time, and sit with you through one of your lectures, and see how differently they do it now from what Professors Runkle and Henck and Watson and dear President Rogers used to do. Personally, we are all very well at our house. We are recovering from the Christmas hurry, and the children are pounding the drum and tooting the horn

a little less continuously." The secretary replied: "Come along. You are welcome at lecture or laboratory. The latter would be the best fun."—Eli Forbes reports that chloride of sodium and sugar still dissolve in water, but that golf is lots better than football, especially when played at Campobello.—Eben Stevens finds playing with his grandchildren much better than golf, but he thinks the saddle horse about the right thing in exercise.—Robert H. Richards from Tech writes of all the list: summer school in New York, Philadelphia, Baltimore, Harrisburg; bass fishing on Belgrade Pond, Maine; climbing hills about Lake Placid, Adirondacks; Niagara Falls; Buffalo; and November in Mexico. The latter stands out as an event of a lifetime, and one of the greatest eye-openers he ever had. The Mexicans gave a royal welcome to the American Institute of Mining Engineers. They are, indeed, a kind and hospitable people, and deserve to reap the benefits of the progress they are now making.—James P. Tolman from West Newton writes: "My ties to the Institute are being renewed and strengthened by the fact that my older son, R. C. Tolman, is now editor-in-chief of the *Tech*. Professionally, so to speak, I have installed at the power-house of our company, the Sampson Cordage Works at Shirley, a Dodge system rope drive operated by a braided cotton rope of our own construction."

1876.

JOHN R. FREEMAN, *Sec.*, 4 Market Sq., Providence, R. I.

Joshua B. F. Breed has recently been elected by the Board of Public Works chief engineer of the Bureau of Engineering of the city of Louisville, Ky. Mr. Breed has been connected with the department for twenty years, during the last twelve of which he has been first assistant engineer.

1879.

HARRY H. CAMPBELL, *Sec.*, Steelton, Pa.

The class held its annual meeting on December 27 at Young's Hotel.—Walter S. Allen has just entered the employ of the Amer-

ican Bell Telephone Company. Congratulations can be extended to him on the birth of a daughter.—Edwin C. Miller, the former treasurer of the Technology Club, is receiving congratulations on the birth of a daughter, also. Fortunately, Technology believes in coeducation. Mr. Miller's eldest daughter, Barbara, graduates this year from the Quincy Mansion School, Wollaston. She has been honored by election to the presidency of her class.—William Aiken, formerly architect to the Treasury Department, has been appointed Consulting Architect to the Department of Buildings of New York City under the Low administration.

1882.

WALTER B. SNOW, *Sec.*, Watertown, Mass.

George Faunce is now president of the Pennsylvania Smelting Company, with office at 331 Fourth Avenue, Pittsburg, Pa.—Charles D. Jenkins has resigned his position as one of the governors of the Massachusetts Automobile Club, which he was instrumental in organizing.—Edgar B. Thompson, who is now mechanical engineer of the Chicago & North-western Railway, is a member of the Western Railway Club.—The home address of Charles A. French has been changed to 43 Strathmore Road, Boston.—Thomas B. Carson is now secretary and treasurer of the Bettendorf Metal Wheel Company of Davenport, Ia.—Rufus F. Herrick's position is now defined as chemist and technician at the Boston works of the New York and Boston Dyewood Company, 300 Border Street, East Boston.—John F. Low is president and treasurer of the Low Tile Company.—James P. Munroe is a member of the Executive Committee of the Society of Arts and of the Massachusetts Reform Club. An article by him, entitled "Sparing the Rod," appeared in the December *Educational Review*.—George W. Mansfield is now located in the Bowling Green Building, 11 Broadway, New York, N.Y., and is connected with the C. E. Dustin Company.—Lyman L. Gerry is resident engineer of the Massachusetts Highway Commission, with headquarters at Stone-

ham, Mass.—Francis P. Hall is temporarily settled in Wolfboro, N.H.—A few members of the class recently met Frank Cheney, Jr., at the Technology Club on the occasion of a short visit to Boston.—The firm of Snelling & Potter has recently opened a branch architectural office in Jacksonville, Fla., where Snelling has been during the past few months.—Henry F. Ross is president of the Mercantile Wharf Corporation of Boston.—W. H. V. Rosing has changed his home address to 179 53d Street, Chicago, Ill.—The twentieth anniversary dinner of the class will be held in February. Special efforts are being made to secure the largest attendance at any dinner since graduation. A complete class report is in preparation.

1883.

HARVEY S. CHASE, *Sec.*, 8 Congress St., Boston.

Foran is in New York, concluding an arrangement with the International Pump Company that will transfer him to New York.—Gale is wrestling with a proposition that may take him to London.—Harvey S. Chase has been called in by Mayor Collins to investigate and report on various city departments.

1884.

DR. AUGUSTUS H. GILL, *Sec.*, Mass. Inst. of Tech., Boston.

Five members, in response to the invitation of the secretary, gathered at the Technology Club on the 28th ult. for an informal dinner. Reminiscences of travel were indulged in, and a pleasant evening spent.—Gill and Puffer served as experts last summer in the subway explosion case, the former for the gas company, the latter for the Edison Illuminating Company. Gill has to announce the advent of a daughter Helen on Nov. 16, 1901.—Otis has been quite seriously ill at home for the past six months with a nervous affliction.—Horton has been painfully ill for three weeks with inflammatory rheumatism as a sequence of vaccination.

1885.

PROF. E. B. HOMER, *Sec.*, Rhode Island School of Design,
Providence, R.I.

Following is a letter received by the secretary from Arthur K. Hunt:—

PORTLAND, ME., Dec. 30, 1901.

Yours of December 28 is received. I think, when you are going to throw bombs at a fellow, you ought to give him a little warning. However, here goes. After leaving the Institute in April, '83, I went to Europe for seven months, and, upon coming home, at once entered my father's office and took part in that business (West India business) as clerk and later as partner, until July, 1896. To go back a trifle. In October, 1895, I came down with nervous prostration and dyspepsia, which took me out of the office.

In March, 1896, just as I was beginning to get a little better, my father died very suddenly; and, as I was not then able to carry on the business, it was sold to the other partner. So, as I said before, in July, 1896, I withdrew from that business. That same date I took an interest in another business which my father previously had,—namely, the selling of refined sugar in this market as representatives of the American Sugar Refining Company; and I am still a partner in that firm (George S. Hunt & Vram), although I give practically no attention to the daily details of the business.

In June, 1896, I was elected a director in the Merchants' National Bank of this city, in whose affairs I am very much interested. Jan. 1, 1897, I became a partner in the firm of Swan & Barrett, a firm that has been conducting a general banking business and selling investment securities since 1867. This is really my present business, and the one to which I give the most time.

Feeling it was my duty as a citizen to take an active interest in city affairs, I have already served two years in the city government, and am now entering upon the third year, being this time chairman of the board of aldermen. This work is at times quite interesting, and I consider the experience a desirable one for any young man; but it certainly requires a great deal of time, and, like a good many other things, I shall be glad when it is over. . . . I cannot conceive how this would be of any special interest to anybody, and I guess the best place for it is in the waste basket.

E. H. Mumford is secretary of the Tabor Manufacturing Company, of Philadelphia. Wilfred Lewis, '75, is president of this company. They are working eighty men, and shipping \$10,000 worth of foundry moulding machines a month. Mr. and Mrs. Mumford, with two boys and a girl, reside at Overbrook, Pa.—Frank A. Pickernell is chief engineer of the American Telephone and Telegraph Company at 22 Thames Street, New York, N.Y. Mr. and Mrs. Pickernell, with two children, a boy and a girl, reside at Montclair, N.J.—John T. Lyman is a manufacturer of doors, sashes, and trims, 150 Nassau Street, New York, N.Y. Mr. and Mrs. Lyman, with four children, live at Montclair, N.J.

1886.

ARTHUR G. ROBBINS, *Sec.*, Mass. Inst. of Technology, Boston.

The annual meeting and dinner of the class was held at the Technology Club on Monday evening, December 30. Eleven members were present. The class officers were re-elected.—W. H. Chadbourne, Jr., has resigned from the United States engineer service, and accepted the position of supervising engineer with Pratt, Read & Co., Deep River, Conn.—W. F. Jordan has recently been appointed resident engineer of the eastern district of the N. Y. C. & H. R. R.R., with headquarters in New York.—Arthur C. Anthony has accepted the special agency for the German-American Insurance Company of New York, with headquarters at Albany.—Clarence L. Kimball is master mechanic for the Tremont and Suffolk Mills of Lowell.—On June 5, 1901, L. F. Cutter and Mary P. Osgood were married; and on July 3, 1901, Edward L. Pierce and Mary H. Nelson were married.

1887.

EDWARD G. THOMAS, *Sec.*, 4 State St., Boston.

Granger Whitney has recently accepted a position as superintendent of the iron department of the La Follette Coal, Iron and Railroad Company, and is now located at La Follette, Tenn. His engagement

to Miss Julia Pittman, of Detroit, has been announced.—Victor I. Cumnock has moved to New York, and may be found at 49 Wall Street, where he has associated himself with Mr. Brundage in the work of financing and promoting industrial enterprises and combinations.—George Otis Draper will sail for Europe on January 22 on a trip of four months.—Lyman Farwell was married in March last to Miss Cora Howes, of Los Angeles. He has decided to again make his home in that city after some time spent in the Klondike and a year or two in New York.—Professor Sever, of Columbia, spent Thanksgiving week in Boston. Many Tech men are much indebted to him for the courtesies extended to them at the Buffalo Exposition, where Professor Sever had entire charge of the electrical department.—T. W. Sprague is now completing a power transmission and haulage plant for the Empire Coal and Coke Company in the Pocahontas field, and has recently made extended trips to Cape Breton and North Carolina to report on mining operations.—H. S. Adams and E. G. Thomas spent the summer and fall at Butte Valley, Cal., where they are engaged in developing the Sunnyside mining property. Mr. Adams has also made an extended investigation and report on a placer mine of the Cœur d'Alène region in Idaho.—F. Manton Wakefield has recently returned from a ten months' stay in Europe, which was devoted to architectural study and investigation, chiefly in Italy, France, and England, also visiting Switzerland, Normandy and Brittany, Belgium and Holland. He incidentally took some four or five hundred photographs, architectural and otherwise, which contain much new and characteristic material, and are pronounced very successful. He is now busy again at his office, No. 1 Somerset Street, Boston, and is glad of it.—Winthrop Cole has been chosen secretary of the Washington Alumni organization. He spent the holidays in Boston and vicinity.

1888.

WILLIAM G. SNOW, *Sec.*, 245 No. Broad St., Philadelphia, Pa.

A. S. Mann left for Sydney on October 18. He goes to Australia as representative of the General Electric Company.—

Clarence B. Vorce, of Hartford, Conn., is the engineer of a street railway enterprise near Albany, N. Y.—Russell Robb's new house on Punkatasset Hill, Concord, Mass., is nearing completion, ready for occupancy in the spring.—Stone & Webster have recently made an inspection and report on the property of the New England Gas and Coke Company, for Kidder, Peabody & Co., who were considering the reorganization of the company.—Louis A. Ferguson spent three months travelling in Europe last summer, accompanied by his wife. He visited all the important electrical plants in London, Glasgow, Paris, Berlin, Prague, Milan, Florence, and Vienna, incidentally taking in Venice, Rome, and Naples, making the ascent of Mount Vesuvius, visiting Switzerland, and sailing down the Rhine. He gave an illustrated lecture on his travels before the Edison Club awhile ago.—Samuel G. Neiler is now of the firm of Pierce, Richardson & Neiler, consulting electrical engineers, Manhattan Building, Chicago.—Wilson B. Parker, of Parker & Austin, South Bend, Ind., reports a rushing business in the architectural line.—Charles L. Weil, in charge of the mechanical engineering department of Michigan Agricultural College, recently made his annual inspection of Chicago power plants with his Senior Class of forty-three students.—B. R. T. Collins has been elected senior vice-commander of the Illinois Commandery of the Naval and Military Order of the Spanish American War, of which President Roosevelt is national commander.

1889.

WALTER H. KILHAM, *Sec.*, 9 Park St., Boston, Mass.

About seventy-three replies have been received to the circular which was sent out by the secretary, asking for information upon which a Class Book might be based. These replies have come in very slowly, and in many instances have been obtained only after repeated requests from the officers of the class. As a rule, the promptest answers have been sent by men living at a distance from Boston, who are naturally more interested in hearing of the welfare

of their classmates. In many cases those men residing or doing business in Boston have not answered at all. This apathy is very discouraging to those having the book in hand; and it is hoped that all who read this will at once send their replies in, unless they have personal reasons for not doing so. A dinner and reunion is projected for the middle of March, as authorized by the class last year.

1890.

GEORGE L. GILMORE, *Sec.*, Lexington, Mass.

John O. DeWolf and Miss Anna S. Frothingham were married October 17. They will reside at 36 Hawthorn Street, Cambridge, Mass.—William Z. Ripley, a member of the United States Industrial Commission, addressed the Society of Arts on Oct. 25, 1901, on "The Present Condition of American Railroads as compared with the Period of Depression from 1893 to 1897."—Deputy Superintendent of Sewers Guy C. Emerson was appointed acting superintendent of streets on Nov. 26, 1901. He was also appointed by Mayor Hart bridge commissioner on the part of the city of Boston, and smoke inspector.

1892.

PROF. SEVERANCE BURRAGE, *Sec.*, Purdue University, Lafayette, Ind.

The class of '92 was well represented at the alumni banquet held at the Hotel Brunswick, Boston, December 27, the following men being present: Samuel N. Braman, John A. Curtin, Gorham Dana, Carleton E. Davis, Louis Derr, Edward R. French, Edward C. Hall, Jesse F. Johnson, William A. Johnston, Leonard Metcalf, and Theodore H. Skinner.—William Esty, formerly associate professor of electrical engineering at the University of Illinois, has resigned his position in order to accept a call to a similar position at Lehigh University.—Jesse F. Johnson, who, by the way, is now in general charge of the several works of the Hamilton Powder Company, located at Belœil and Windsor Mills, Can.,

and at Nanaimo, B.C., with headquarters at Montreal, reports that he has now in his employ G. J. Burnham, '92, Course X., whom he has sent out as superintendent of the Pacific coast works of the Hamilton Powder Company, which are located at Nanaimo, B.C.—S. N. Braman, who was until recently at the New York office of the Westinghouse, Church, Kerr Company, has been transferred to the Boston sales department, which covers the field of New England and the provinces.—E. C. Hall has given up his lumber interests in the West, and returned to his home at Watertown, in order to relieve his father in his business interests there.

1893.

FREDERIC H. FAY, *Sec.*, 60 City Hall, Boston.

Three class meetings will be held this winter at the Technology Club, 83 Newbury Street. There will be two informal Saturday evening meetings, on January 18 and February 15. At each of these dinner will be served at half-past six (charge 75 cents), and the evening will be devoted to a "smoker" and to general sociability. On the evening of January 18, C. M. Spofford will describe the manufacture of steel, to illustrate which he will show a number of interesting lantern slides. With the aid of the lantern, also, H. N. Dawes will tell of a few incidents of a trip abroad made by himself and W. W. Crosby last summer. A portion of the second informal evening, February 15, will be taken by C. L. Norton for a description of his investigations of ribbed and prismatic glass. Norton is the first of our number to become a member of the Institute Faculty. His study of the transmission of light by these particular kinds of glass has made him pre-eminently the authority on the subject, in this country at least. The Annual Meeting and Dinner will occur on Saturday evening, the 15th of March, the business meeting to be held at six o'clock, and the dinner (charge \$2.50) to be served at 6.45 P.M. Following our custom of the last few years, formal speech-making at this dinner will be dispensed with. The class will have the good fortune,

however, to entertain Lieutenant Homer B. Grant, U.S.A., who will tell us of some incidents of his Philippine service.

At the annual dinner of the Alumni Association on Friday evening, December 27, the following '93 men were present: Bemis, Braman, Crosby, C. E. Davis, Dawes, Fay, Frisbie, A. L. Kendall, H. A. Morss, Parks, Pickert, Reynolds, Spofford. At the business meeting preceding the dinner F. H. Fay was elected one of the vice-presidents of the Alumni Association. The following members of the class are now associate members of the Alumni Association: Bremer, Brockunier, Buckley, Cadwell, G. S. Carney, Ellms, Fabyan, Fairfield, Graves, F. Houghton, Howe, G. I. King, Mirick, A. L. Moore, C. F. Morse, W. B. Page, W. T. Peck, C. W. Sawyer, Towne, Waitt, A. Walker, Whiston, Whiting, Wingate. The section in the constitution governing the election of associate members is as follows: "Any other member of a class which has graduated may become an associate member on election by the Executive Committee. Applications for associate membership shall be submitted in writing through the secretary of the association to a membership committee of seven, which shall meet at least twice a year; and names of persons recommended by the Committee for associate membership shall be reported to the Executive Committee, and the names of those elected by the Executive Committee shall be announced by the secretary in connection with the call for the next ensuing meeting of the Association." It is the belief of the Executive Committee of the class that many others will wish to avail themselves of this opportunity to become directly connected with the Alumni Association, and the secretary will be pleased to communicate with those who desire to take such a step.

The following changes of address among the class members have recently been received: O. W. Albee, with bridge inspection department, N.Y. C. & H. R. R.R., and is now stationed at Trenton, N. J., at the Trenton Branch of the American Bridge Company.—F. S. Badger, resident engineer, Middlebury, Vt., water-works, 28 Bellevue Street, Lowell, Mass.—W. T. Barnes, with L. Metcalf (14 Beacon Street, Boston), 773 Broadway, South Bos-

ton, Mass.—S. N. Braman, with Westinghouse, Church, Kerr & Co., 26 Cortlandt Street, New York, N.Y.—H. L. Clapp, with Pierce & Fischer, patent attorneys, 115 Monroe Street, Chicago, Ill.—C. R. Darrow, with Daboll & Crandall, Waterford, Conn.—A. Farwell, composer and lecturer, 14 W. 45th Street, New York, N.Y.—W. B. Gamble, vice-president and assistant manager, the Champion Mine (Silverton, Col.) Orchard Lake, Mich.—B. M. Mitchell is at present a captain in the English army with South African Field Forces. His address is care of Fraser & Chalmers, Ltd., P. O. Box 619, Johannesburg, Transvaal, South Africa.—W. S. Resor, engineers' department, Central Union Telephone Company, Washington Street, Chicago, Ill.—W. I. Swanton, League Island Navy Yard, Philadelphia, Pa.—S. E. Whitaker, Street Railway Engineer; Treasurer, the Massachusetts Engineering Company, 43 Milk Street, Boston, Mass.

On June 10, J. C. Boyd met with a painful accident. He is road-master of the Boston Elevated Railway, and on that date was on the elevated structure, looking at a train which was standing on a curve. The train started without notice; and as he was on the outside of the curve, the end of the car, projecting over the track, pushed him off into the street. His back and one foot were badly hurt, and he was taken to the City Hospital. He was unable to do any work for about six weeks. At present his back is nearly well, but he still suffers from lameness in the injured foot.—A. L. Kendall, who has until recently been a chief draughtsman of the Factory Mutual Fire Insurance Companies, has been promoted to the position of inspector. His duties require him to travel almost constantly, although he still keeps a residence in Framingham, Mass.—A. H. Jameson, who was formerly associated with J. W. Logan in the manufacture of steel castings at Phoenixville, Pa., is now at Attleboro, Mass., where he is manager of the smelting and refining department of the Cornell-Andrews Smelting Company.—W. G. Houck made a brief visit to Boston in September for the purpose of starting his brother at the Institute. Houck is secretary-treasurer of the Buffalo Structural Steel Company which built the structural frame for one of the Buffalo Exposition buildings.—As briefly mentioned

in the October number, W. W. Crosby and H. N. Dawes last summer made a trip together through England, Scotland, Belgium, Holland, Germany, Switzerland, and France. The trip was to some extent a business one for Crosby; for he improved the opportunity to visit the leading European textile schools, as well as a number of machine shops and factories, in search of ideas that might be utilized in the large extension (now building) of the Lowell Textile School, of which he is principal. He warmly praises the United States consular service; for, through the efforts of our consuls, his facilities for this investigation were considerably increased. Crosby was fortunate in meeting many of the best known men in textile work, and he returned with the feeling that, although we have much to learn along these lines, America is by no means at the rear of the procession.—Sam Hugh Brockunier, of Wheeling, W. Va., and Miss Clare Sawyer Reed, of Lowell, Mass., were married Oct. 30, 1901. Brockunier has already made an enviable reputation as a mining engineer. His many friends will extend their heartiest congratulations upon this his latest and greatest achievement.—Charles M. Spofford is delivering a course of lectures on structural design before an evening class at the Rhode Island School of Design, Providence. E. B. Homer, formerly associate professor of architecture, and now lecturer on architecture, at the Institute, is director of this school.—A book entitled "The Population and Finances of Boston," by Frederic H. Fay, has recently been issued by the municipal printing department of that city.—S. P. Waldron has recently been made chief draughtsman of the Berlin plant of the American Bridge Company. His address is now East Berlin, Conn.—William R. Copeland, chief bacteriologist to the experiment station of the Philadelphia Water Works, formerly of the Lawrence, Mass., experiment station, and later of the testing station of the filtration commission of the city of Pittsburg, recently gave two lectures at the Institute on "The Bacteriological Testing of Municipal Water Filters" before the fourth year class in bacteriology of water and sewage.—For nearly three months Edward M. Hagar has been in Cuba, and his return is expected early in the year. Hagar is manager of the cement department of the Illinois Steel

Company, at 1060 The Rookery, Chicago.—C. D. Demond has just left Boston to accept a situation with the Anaconda Copper Mining Company at Anaconda, Mont.—George E. Merrill is still at Annapolis, Md., as superintendent of construction and inspector for the United States government in charge of the new buildings now being built for the Naval Academy. The importance of this work will best be appreciated from the fact that the government is spending ten million dollars upon these buildings.—F. W. Baker is again in Scotland on business in connection with his profession of naval architecture.—William B. Page has been made superintendent of the Leominster mill of the George W. Wheelwright Paper Company, and he now resides in Leominster, Mass.

1894.

SAMUEL C. PRESCOTT, *Sec.*, Mass. Institute of Technology, Boston.

Of about one hundred and thirty-five men from whom information has been recently received, about ten per cent. report changes in occupation or location, while nearly ninety per cent. occupy positions with the same companies or institutions as last year. In many cases it is evident that an advance in position and responsibility has been made. It is hoped that in the next number of the REVIEW a classification of the members of the class may be made that will prove of some value in showing the positions occupied by Institute men eight years after their graduation. W. H. Bovey has been made superintendent of the mills of the Washburn-Crosby Company at Minneapolis.—Stephen A. Breed has gone into business as an interior decorator. His address is now 25 Walcott Street, Malden.—Arthur A. Clement has been made vice-president and manager of the American Wire Fence Company of Chicago, with offices at 200 Monroe Street.—Nathan B. Day is with Macleod, Calver & Randall, patent attorneys, Boston.—A. J. Farnsworth is assistant chief engineer of the Consolidated Railway Electric Lighting and Equipment Company of New York City.—R. Waldo Gilkey has left Boston to become the superintendent of

the Silver Lake Mining Company at West Ossipee, N.H.—Theodore Horton, who for several years has been assistant engineer for the Metropolitan Sewerage Commission of Boston, has accepted a position with Rudolph Hering and George W. Fuller ('90), the well-known hydraulic engineers and sanitary experts of New York. Horton has had a wide and valuable experience in sanitary engineering, and will prove a strong assistant to the distinguished gentlemen with whom he is now associated.—Ned H. Janvrin is assistant engineer with the American Bridge Company of Wissahickon, Philadelphia.—Herbert E. Johnson is manager of the telephone exchange at La Grange, Ill.—Joseph H. Kimball is now assistant engineer of the city of Newton.—W. H. King remains in New York with the judge of the Supreme Appellate Court, but has changed his address to 137 West Forty-third Street.—Colbert A. MacClure is senior partner of the architectural firm of MacClure & Spahr, 607 Ferguson Building, Pittsburg, Pa.—Henry K. McGoodwin has been elected Instructor in Architecture at the University of Pennsylvania.—William D. McJennett has returned to Boston after seven years' absence, and has entered into partnership with G. W. Sherman as mechanical and chemical engineers. McJennett has occupied a number of chemical engineering positions in New York and Chicago, especially devoting himself to the soap-making industry.—Sherman, by the way, is not content with being a partner in the Boston firm, but in addition is superintendent of the North-western Rubber Company of Liverpool, England. He soon sails to take up his duties in this capacity, and all will wish him success in the new undertaking.—C. A. Meade has retired from the position of superintendent of final disposition in the Street Cleaning Department of New York City, to accept a position in the purchasing department of the American Agricultural Chemical Company.—Parker C. Newbegin is in the engineering department of the Bangor & Aroostook Railroad, with headquarters at Houlton, Me.—Samuel C. Prescott has translated the valuable work of Professor Effsont, of Brussels, on the Enzymes and their Practical Application. The book will be out very soon, being published by John Wiley & Sons.—

Louis W. Pulsifer, last year holder of the Rotch Travelling Fellowship in Architecture, is practising his profession. He may be addressed at 8 Birch Hill Road, Newtonville, and can no doubt give all prospective clients the greatest satisfaction.—Howard S. Reynolds has gone South to become manager of the Columbus Railroad, Columbus, Ga.—Arthur S. Rogers has moved from Omaha to Chicago, but is still with the American Telephone and Telegraph Company.—S. Anthony Savage has been stationed at Port Richmond, Staten Island, care of the Burlee Dry Dock Company. His position as assistant superintending engineer of the United States Lighthouse Board gives him abundant opportunity to become familiar with government construction work along the north-eastern coast.—Frederick A. Schiertz sends his address as Guadalupe y Calvo, Estado de Chihuahua, Mexico.—W. O. Scott is still milk inspector of Providence, in spite of strenuous efforts on the part of certain milkmen and politicians to oust him. It is gratifying to learn that he not only makes a most efficient official, but that he regards his position as a scientific one, and is continually improving the methods of analysis and inspection in this important work.—Henry A. Swanton is taking a year at the Institute as a graduate student in Naval Architecture.—Theodore Varney is now located in Pittsburg, where he has a position with the Westinghouse Company.—William R. Westcott is manager of the New England Telephone and Telegraph Company at Manchester, N.H.—Robert C. Wheeler is no longer with the Isthmian Canal Commission, but has an engineering position in the government service in the Philippine Islands.—During the summer, F. P. McKibben designed twenty-three bridges for the Berkshire Street Railway, a line about fifty miles long, running from Cheshire to Great Barrington, and also had charge of a test on a fireproof floor for the Columbian Fireproofing Company.—George A. Taber and C. D. Pollock represent '94 with the New York Rapid Transit Railroad Commission. Last July Pollock was promoted to senior assistant engineer of the Sewer Division, New York Rapid Transit Railroad Commission.—Julian G. Estey is vice-president of the Estey Organ Company, Brattleboro, Vt.—The secretary of the

class earnestly requests that members send him notices of their achievements in all lines, and of their changes of address whenever these occur. There is danger of too great modesty in these matters, so it is hoped that men will send information in regard to other members of the class, also. If duplicate notices are received, it can do no harm.—The many friends of R. B. Price will be glad to learn that he is now on the road to recovery from a recent illness due to overwork.—'94 was represented at the Alumni dinner by Kendall, R. D. Reynolds, Thorndike, and Prescott.

1895.

GEORGE W. HAYDEN, *Sec.*, 493 Warren St., Roxbury, Mass.

Extract from a letter written by F. E. Matthes, June 3 1901:—

... My first experience in charge of a topographic party was in 1898, immediately after my appointment as Assistant Topographer. I was sent to the Bighorn Mountains in Central Wyoming. No information being obtainable concerning that region, I was left to work out my own salvation. I was given a "wagon outfit" (we live in camps), but soon found it necessary to transform it into a pack outfit (which is not a simple matter when one is forty miles from the nearest point of supply). That season I had no other trails except those we chopped ourselves. We were our own guides, and for three months never saw any other men besides ourselves (there were four of us). Our lowest camp in those mountains had an elevation of 8,000 feet. Some were little short of 10,000 feet. The highest peak in the Bighorn, named Cloud Peak, I found to be 13,165 feet (by trigonometric control). I climbed this peak later on. The next summer I returned to this wilderness, and completed what is now published as the "Cloud Peak Sheet." I also completed my studies of the glacial topography of that region; and, while these were originally undertaken as a hobby only, I was finally invited to publish them in the Twenty-first Annual Report of the Geological Survey. (The publication is out in separate form under the title of "Glacial Sculpture of the Bighorn Mountains of Wyoming.") A year ago I started out for Northern Montana, being specially detailed to the hydrographic division of the Geological Survey. For

nearly two months (May and June) I reconnoitred throughout the length and breadth of the Blackfoot Indian Reservation, along the east foot of the Rocky Mountains, gauging streams and prospecting for irrigable land. I also made the preliminary investigations for the contemplated diversion of water from St. Mary River into the Milk River, a most fascinating and ambitious scheme. St. Mary River is the southernmost fork of the Saskatchewan, and heads in the Rockies in Northern Montana. Milk River is virtually the northernmost head of the Missouri. Both streams flow across the Canadian boundary. Only the Milk River returns some hundred miles further east. The proposed canal must remain south of the boundary, and will cross the continental divide between the drainage systems of Hudson's Bay and the Gulf of Mexico.

I reported the scheme feasible; and the necessary surveys and estimates are now being made, much to the annoyance of the Canadians, who seem to fear that the whole Saskatchewan will run dry after the new canal is constructed. While among the Indians I had an unusually fine opportunity to witness their sun-dance on the 4th of July. Fully two thousand Blackfeet, Piegans, and Bloods (all Sioux tribes) were assembled for the occasion; and their camp was a veritable city of tepees. It is not likely that another sun-dance of such proportions will occur in the future, and I congratulate myself on my very good fortune.

Last summer I spent in doing topographic work in the Rocky Mountains immediately south of the Canadian line. It is an extremely beautiful but almost unknown region, containing scores of large glaciers which have never been described or studied. In short, it is a most fascinating region to explore. . . .

1896.

F. E. GUPTILL, *Sec.*, 1006 E. Main St., Richmond, Va.

William L. Root has recently taken charge of the Physics Department, Newark High School, Newark, N.J.—The new office of the Virginia Electric Railway and Development Company, with which F. E. Guptill is connected, was recently destroyed by fire. The fire started from the explosion of some material in the basement, and spread so rapidly that one man was caught in the basement and burned to death, while one of the stenographers was

seriously injured by jumping from a second story window. Others made their escape, some by jumping to neighboring roofs and some by sliding down the elevator ropes. Other offices were immediately obtained, and the office routine resumed.—Ernest C. Atkins was married to Miss Gertrude C. Fuller at Portland, Me., Oct. 7, 1901. They are now living at Providence, R. I.—J. Melton Howe was married to Miss Rowena Thomson at Cleburne, Tex., on Dec. 13, 1901—Charles Morris, assistant paymaster in the United States Navy, visited Boston and suburbs during a leave of absence the latter part of the summer.

1897.

JOHN A. COLLINS, JR., 55 Jackson St., Lawrence, Mass.

William Edward Cutter was married on Wednesday, October 9, to Miss Mary Elizabeth Rourke, of Cambridge.—Charles H. Eames and Miss Mary Wood Richardson, of East Billerica, were married on Monday, Nov. 18, 1901.—The secretary wishes to apologize to the members of the class for the non-appearance as yet of the annual class letter, also for the delay in holding the class dinner. Never fear, the former is just as sure to come as is the tax bill. However, he feels that he can furnish a good excuse to those who apply for the same in writing.—Jesse W. Shuman is with the Red River Lumber Company in Minnesota. He has recently built a twenty-mile telephone line along the logging railroad of the company, and at last reports was engaged in installing an electric light plant at Akeley, Minn., where the mills are located.—We clip the following from the *Paper Trade Journal*: "A. C. Lamb has been appointed assistant to T. S. Kingsland, the local sales agent of the American Writing Paper Company. Mr. Lamb has been for the past four years in the mills now known as the Hurlbut Division, and the Nonotuck Division of the company. He has served in all the various capacities in these mills, and is consequently very well equipped to talk paper to the writing trade." Mr. Lamb is located at 132 Nassau Street, the Vanderbilt Building, New York, N. Y.—

A. T. Drew died at the Massachusetts Homœopathic Hospital November 5, as the result of appendicitis. "Albert Thompson Drew was born in Biddeford, Me., Nov. 17, 1874, in which place his early childhood was spent. When he was nine years old, his parents removed to Wakefield, Mass.; and three years later, in September, 1886, they took up their residence in Newburyport, Mass. Here he finished his grammar school course, and prepared for the Massachusetts Institute of Technology at the Newburyport High School, from which institution he was graduated with honors in June, 1893. The following autumn he entered the Institute, and was very successful in his work there until the spring of 1897, when he had a severe illness, which, coming so near the end of his college course, necessitated his returning to the Institute for another year. Three months before graduation he received and accepted a promising offer from the Farbenfabriken of Elberfeld Company, one of the largest dyestuff manufacturing firms in the world. The position was held for him until after he was graduated; and he entered their New York office in July, 1898. From October of that year until the following April he represented this firm in several of the Western States, with headquarters at the Chicago office. On April 5, 1899, he was married to Miss Jennie Adams, of Newburyport, and at that time was transferred to Atlanta, Ga. One child, a girl, was born to them in June, 1900; but she lived only till July, 1901. Mr. Drew resided in Atlanta until the first of April, 1901, when he was again transferred, this time to the Boston office of the same firm. He represented them in many of the cities and towns in Eastern Massachusetts. This position he held at the time of his death." Drew will be remembered not only by all of his own class, but by many of the other students. Always good-natured, ever looking at the bright side of things,—even flunks,—he was popular with instructor and student alike. To the members of Course X,—that merry band of toilers—will his loss be the most keenly felt. Two good men—Allen the other one—have we lost; and, as one of that fatal Course, I cannot refrain from breathing a prayer that for a time, at least, the avenging angel halt in his path, that we may recover from our present grief.

1898.

C.-E. A. WINSLOW, *Sec.*, Hotel Oxford, Boston, Mass.

The first informal class reunion for the season was held at the Technology Club on the evening of November 6, with the following men present: Benson, Bleecker, Butcher, Coombs, Curtis, Dawes, Hopkins, H. W. Jones, Kaufman, Kendall, Leonard, Philbrick, Pratt, Richmond, Russ, Russell, Rutherford, Shedd, Sherman, C. H. Smith, Stillings, Swan, M. E. Taylor, A. H. Tucker, Vining, Wesson, C. F. Wing, Winslow. A telephone message was received from Coburn in New York City during the evening; and a telegram of congratulations, signed by all the '98 men present, was sent to Huntington at Watertown, N.Y., as it was discovered that this was the occasion of his marriage to Miss Helen J. Treadwell, of that city.—At least four other '98 weddings have taken place during the autumn: On October 17, Elliott R. Barker was married at Bartlett, N.H., to Miss Agnes Blanche Chandler. They will reside at Berlin, N.H., where Barker is engaged with the Burgess Sulphite Fibre Company.—Winthrop B. Wood was married, November 26, to Miss Annie Cavendish Millett, to whom he has been engaged for two years. Mrs. Sophia A. Towne, the grandmother of the bride, gave a wedding reception for the young couple at 25 Washington Street, Beverly, Mass.—Charles J. Skinner was married, November 5, to Miss Rachel Isabel Baldwin, of Ottawa, Kan. They are residing at 534 Ash Street in that city.—Frank B. Perry was married, December 4, at 80 Thorndike Street, Brookline, to Miss Ellen Louise Barrett. They will be at home after February 19 at 1 Federal Street, Providence, R.I. Perry was critically ill with appendicitis during the summer.—It is rumored that Leroy D. Peavey was also married early in November.—Henry P. Richmond announces his engagement to Miss Nelly S. Wilson, of Nahant.—J. T. Robinson, Jr., is engaged to Miss Pearl Graham, of Hyde Park. Robinson had a very interesting exhibit at the New York Automobile Show during the week of November 4, and sent complimentary tickets to some thirty-five of the '98 boys in New

York, many of whom were glad to avail themselves of his courtesy.—L. A. Miller is now at the Hotel Wilmington, Wilmington, Del. He is still in the Internal Revenue Service.—Another wedding besides those mentioned above is that of Frank S. Tucker, who was married to Miss Caroline T. Graves, at Marblehead, on October 10.—L. C. Allen is in the dairy business in Brockton.—'98 men are glad to greet Kaufman in Boston again. He has given up mechanical engineering to become a member of the firm of Cupples & Schoenhof, foreign booksellers, at 128 Tremont Street.—Philbrick is also in Boston once more. He is now connected with the Factory Mutual Life Insurance Company at 31 Milk Street.—Dr. H. W. Jones is house officer at the Children's Hospital, Huntington Avenue, Boston.—E. B. Richardson spent a busy summer, superintending the putting in of a 2,500 H. P. station on the Merrimac River, near Concord, N.H.—Springer is the father of a little girl born in the latter part of June.—Hutchinson writes under date of September 19:—

... I take the liberty of sending herewith a dollar, as suggested in that '98 Register. The little volume is very neatly gotten out, and will be a handy thing to put in one's grip, if travelling. I am always much interested in the progress or occupation of my old Tech friends, and read the notes in the TECHNOLOGY REVIEW with great interest. There are many of them whom I should like very much to see, and I am looking forward to meeting them when we have our reunion in 1903. . . .

—Lansing has opened an office in the Fisher Building, Chicago, as consulting and contracting electrical engineer and manufacturers' agent. His descriptions of the meetings of the North-western Association may, as he says, "inspire the Eastern alumni to similar work":—

"The North-western Association, with headquarters here in Chicago, is an extremely lively and booming association. We had the honor last spring of raising a sum of \$5,000, for the Walker Memorial Gymnasium Fund at its annual banquet. This, I think, itself speaks volumes. I am glad to say that there are a large number of '98 men in this vicinity; and quite a number of them take an active interest in the North-western Branch, both at its annual meetings and its monthly dinners. I wish you could be with us at some

of these monthly dinners, which would, I am sure, open your eyes to the pushing West. We meet every month at the Bismarck or some similar restaurant, where each man orders his dinner to suit himself. There are no charges whatever in connection with the same.

“There are always speakers there, alive, up-to-date, who speak on scientific subjects or give practical talks of general interest. It is the aim of the Association to have new information and things of scientific interest brought to the public first through the medium of the Association by these men. The members, numbering all the way from twenty to fifty or more, hear talks by men such as Gathmann, of the Gathmann Dynamite Gun, Professor Hale, director of the great Yerkes Observatory, or men of like calibre with new ideas or with a new tale to tell. These men always give their services gratis. We have exhibitions of colored photography, moving pictures, liquid air demonstrations, and such things that keep men in touch and abreast with the times. Not only are these meetings scientific and practical, but the boys also have a jolly good time, and come closer in touch with each other than it were otherwise possible to do. This may be an old story to you; but I call your attention to it, in order that it may, through your influence, inspirit the Eastern alumni to similar work. The great success, however, is due largely to our extremely efficient president, I. W. Litchfield of the class of '85, and his two right-hand men, E. L. Andrews of the class of '94 and Edward M. Hagar of the class of '93.”

In a competition, held last summer, for the design of a new city hall for the city of Newark, N.J., one of the plans submitted was drawn by Conklin. His plan called for a structure of granite in the style of the French Renaissance; and the building as designed would have been about three hundred feet by two hundred feet in dimensions, and would have included two interior courts separated by a circular staircase hall. The façade as designed by Conklin was figured in the Newark *Sunday Call* for September 22.

1899.

WALTER O. ADAMS, Sec., 1776 Mass. Ave., North Cambridge.

About twenty-five men enjoyed the annual reunion of the class at the rooms formerly occupied by the Technology Club on Saturday evening, December 7. At the business meeting the secretary's

report showed the class to be in an encouraging condition in every way. The announcement of the birth of a Class Boy was duly made; and Roger Willard Cannon, son of Willard Telle Cannon, was unanimously elected to honorary membership in the class as its Class Boy. At the suggestion of the secretary a council of the members was appointed to act as advisers to the secretaries, to audit class accounts, and to take charge of meetings, dinners, and publications during the ensuing year. After the business meeting, informal speaking by members of the class was followed by a most excellent sleight-of-hand performance by a gentleman obtained especially for the occasion. It was to the regret of all present that President Pritchett was at the last moment so indisposed as to prevent his appearance at the dinner. Professor Burton dropped over from a meeting of his old Bowdoin classmates to make a most pleasing and inspiring little speech, which was received with great pleasure and enthusiasm by its hearers. The close of the reunion with the '99 and Technology cheers left many a member with a feeling of regret that so pleasant an occasion was past, and with a determination not only to be present at the next meeting, but to bring others with him. The thanks of all are due to Mr. H. L. Morse and Mr. Miles S. Richmond for their most efficient and successful work as Dinner Committee.— The marriage of Louis W. Shumaker to Miss Harriet Helen Foss on October 9, at Rochester, N.Y., and of Clarence A. Moore to Miss Alice Emory Johnson at Arlington, Mass., on December 4, are announced.— The class of '99 may well be proud of its Class Boy. It has been stated that he is Roger Willard Cannon, and that he was born on March 12, 1901; but a few words in addition may not be out of place. Through the courtesy of his father, W. T. Cannon, of Salt Lake City, we were enabled not only to show at the recent dinner a most attractive photograph of our boy, but to present to each man attending the dinner a small picture mounted upon the menu card. It was most heartily agreed that fortune was distinctly with '99 when the proverbial stork was sent upon his distributing rounds. Congratulations should be mutual between W. T. Cannon and ourselves, upon his luck and ours.— '99

congratulates Arthur L. Hamilton upon the birth of a son. Hamilton Parker Hamilton was born on Sept. 23, 1901, at Marinette, Wis.—A most welcome recent visitor was Albert F. Nathan, Course X. He is now examiner in the Patent Office at Washington, D.C.

1901.

ALBERT W. HIGGINS, *Sec.*, Saylesville, R.I.

The first annual dinner of the graduate class was held at the Technology Club, Dec. 14, 1901. Twenty-six men were present. Very interesting speeches were made by Dr. Pritchett and Mr. James P. Munroe, the guests of the evening. Messrs. Kennedy, Davis, and Rowe gave interesting talks on various topics concerning the class members. The Class Day treasurer's report was read and accepted, showing a balance of \$48.53, which will be used for a class gift to the Technology Club. The treasurer's report, showing a balance of \$51.89, was approved. The secretary's report showed that, out of a total enrolment of 325, only 85 replies to the blanks sent out in the summer had been received. If we are to make a success of keeping track of the members of the class, and if we ever expect to get out a class catalogue, more interest must be shown along this line. The secretary will be glad to furnish information regarding any member upon application, and it is to be hoped that this means will be used to its full value. The following officers for the ensuing year were elected: president, Ellis F. Lawrence; first vice-president, Percy H. Parrock; second vice-president, Herbert H. Kennedy; secretary-treasurer, Albert W. Higgins; assistant secretary-treasurer, William W. Walcott.—E. G. Allen is with Stone & Webster, Boston, Mass.—Frank H. Bass is teaching in the University of Minnesota, Minneapolis.—W. G. Blauvelt is with the American Bell Telephone Company, Boston.—C. N. Chubb is assistant on the engineering corps, P. F. W. and C. R. W., Allegheny, Pa.—F. G. Clapp is assistant in geology at the Institute.—L. duPont is draughtsman for the Pencoyd Iron Works, Pencoyd, Pa.—G. F.

Fisk is engineer for the New York, New Haven & Hartford Railroad, South Terminal Station, Boston.—L. S. Florsheim is rodman on the reconstruction of the Chicago & Alton Railroad, Chicago, Ill.—H. G. Folsom is engineer in the Telephone Building, Pittsburgh, Pa.—Miss A. B. Gallup is assistant in biology at the Rhode Island State Normal School, Providence, R.I.—M. B. Foster was married to Miss Isabell Janette Price, of New York, Thursday, the 5th of December, 1901.—A. G. Hayden is draughtsman for the American Bridge Company, Pittsburgh, Pa.—M. W. Hogle is in the construction department of the Eastman Kodak Company, Rochester, N.Y.—A. L. Klieves is at the Institute, taking advanced work in architecture.—J. B. Laws is a member of the firm of J. H. Laws & Co., Cincinnati, Ohio.—C. E. Martin is with the Smead Iron Works, Jersey City, N.J.—W. I. Martin is draughtsman, National Bank Building, Chicago, Ill.—J. F. Monaghan is in the mechanical department of the Waltham Bleachery and Dye Works, Waltham, Mass.—J. R. Morse is back at the Institute.—R. B. Morton is in the meter testing department of the New York Edison Company, New York.—Ray Murray is draughtsman for the American Bridge Company, Pencoyd, Pa.—Percy Parrock is with the Pennsylvania Steel Company, Steelton, Pa.—O. H. Perry, Jr., is with the Fore River Engine and Ship Building Company, Quincy, Mass.—A. W. Peters is in the engineering corps of the Hudson River Water Power Company, Glens Falls, N.Y.—E. J. Proulx is draughtsman for French & Bryant, engineers, Brookline, Mass.—W. A. Read is draughtsman in the New York Navy Yard.—A. W. Rowe is assistant superintendent of the Victor Shaw Ring Traveler Company, Providence, R.I.—S. W. St. Clair is architectural draughtsman for Coolidge & Carlson, Boston, Mass.—W. J. Sayward is architectural draughtsman, corner of 25th Street and North River, New York.—N. L. Skene is draughtsman for W. Starling Burgess, naval architect, Boston, Mass.—W. I. Sturtevant is in the purchasing department of Stone & Webster, Boston, Mass.—W. G. Sucro is structural draughtsman for Bartlett, Heywood & Co., Baltimore, Md.—W. J. Sweetser was married to Miss Bertha Elizabeth Mandant, of Boston, Thanksgiving Day.—A. J. Taylor is assistant engineer on the

street and sewer department, Wilmington, Del.—R. W. Wright is draughtsman for the Bath Iron Works, Bath, Me.—F. P. Wilcox is leveller on the Gloricta Mountains Railroad, New Mexico.—W. J. Wildes is inspecting engineer on the Wachusett Reservoir.—C. F. Willard is in the Scientific Department of the Eastern Ship Building Company, Groton, Conn.—G. T. Wilson is mechanical engineer with Frank B. Gilbreth, Boston, Mass.—L. P. Wood is rodman on the Metropolitan Water Board Works at Saxonville, Mass.—F. W. Coburn is with the Maryland Steel Company, Sparrow's Point, Md.—F. C. Ayers is with the Fall River Ship Building Company, Quincy, Mass.—Bailey and Church are with the Cramp Ship Building Company, Philadelphia, Pa.—Foljambe and White are assistants at the Institute.

REVIEWS

THE POPULATION AND FINANCES OF BOSTON: A STUDY OF
MUNICIPAL GROWTH

BY FREDERICK H. FAY, M.S. Boston Municipal Printing Office.
1901. pp. 33. Three folded charts.

Predictions based upon accumulated data drawn from past records as to the future actions of a social group of mankind have proved a fascinating field of intellectual examination ever since the suggestive inquiries of the Belgian statistician Quetelet, some fifty years ago. Such prophecies, however, have been, as a rule, confined to the simpler phenomena of life, as birth, death, marriage, and crime. Mr. Fay has taken a wider sweep, and has contributed a study of prediction as to what an organized municipality is likely to do, not only in its demographic relations, but also in its financial operations, such as income, expenditure, and indebtedness. The community which serves as a basis of study is Boston, and the forecaster is most honorably connected with the Massachusetts Institute of Technology as a graduate of the class of '93, and later the recipient of a Master's degree. It is also worth noting that the chief prophet was assisted in the preparation of this forecast by four co-prophets who have received training at the Institute: Thorndike, '95; Maguire, '97; Sherman, '98; and Sawtelle, '98.

There is no question about the interest of Mr. Fay's study, even if one be inapt in mathematics. The aim of the investigation is to determine from a study of available statistics of population, polls, valuation, income, expenditure, and municipal debt of Boston in the past, what the law of growth has been in population and finances, and to make estimates as to what the future opens up upon the basis of the rates thus ascertained. To the ordinary Philistine, who has never enjoyed the pleasures of statistical research and practice, such a task might appear to be both formid-

able and forbidding. Boston has changed her size several times during a half-century; and the sceptic might observe that this municipality is an extremely erratic city, moved by the gentlest whiff of any vagrant fad which may be set in motion on any spot of the globe, and that, consequently, her actions cannot be reduced to precise measurements. These difficulties have no terrors for Mr. Fay. He has patiently collected from various sources the necessary statistical data, not only of original Boston, but of the cities and towns subsequently annexed. He has also valiantly equipped himself with formulæ derived by the method of least squares which has the general form of

$$X = A + Bt + Ct^2$$

in which X is the quantity sought, t is the time in years from 1900 (being negative prior, and positive subsequent, to that year), and A , B , and C are constants to be derived mathematically. "These formulæ are the equations of curves parabolic in shape and concave upward." The method of derivation of the formulæ the present writer, unfortunately, is unable to determine with nice precision; but they have a pleasing appearance, as calculated to reduce the vagaries of even Boston to a minimum. The formulæ which have been derived produce results which show an amazing agreement with the actual records of the past, and, consequently, commend themselves as a safe guide for, at least, the immediate future. In general, it is stated that the valuation of the city of Boston is increasing at a slightly faster rate than the population, while the rate of increase in expenditures is about twice, and that of net debt about three times, the rate of increase in valuation. If a long look be taken ahead, say a quarter of a century, to the year 1925, it discloses a portentous scene. We (the city of Boston) will then have a population of 903,000, a property valuation of \$1,980,000,000, a municipal income from taxes of \$64,300,000, an income from loans of \$39,300,000 (as compared with \$3,163,550, in 1900), expenditures of \$100,000,000, and a net debt of between \$209,000,000 and \$311,000,000, according to the formula selected.

If this be the future, it is certainly high time for the citizens of Boston to get together and seriously study their municipal growth

seize the formulæ by the throat, and switch these curves off into another and less harmful direction.

The author's concluding remarks in regard to matters of municipal expenditures and loans are thoroughly sound and instructive. As a statistical study, it is a most important contribution both as to method and results. The author has not presented his conclusions with an air of dogmatism, and clearly recognizes the qualifications which must be taken into account. He admits that, while some of the formulæ presented are expected to give close estimates for the next few years, none of them will probably be more than approximate twenty-five or fifty years hence; and he concludes with the valuable suggestion that, as statistics of future years become available for data the formulæ be recomputed, for by successive modifications greater accuracy can be obtained.

DAVIS R. DEWEY.